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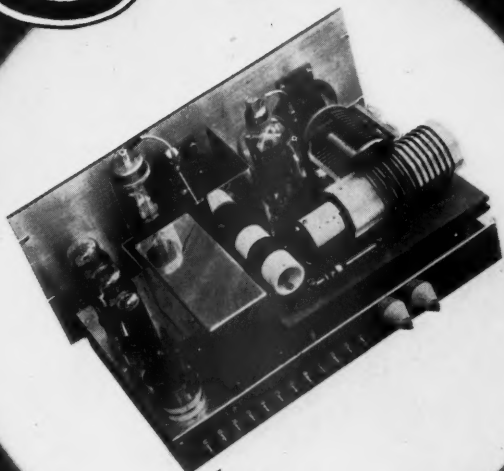
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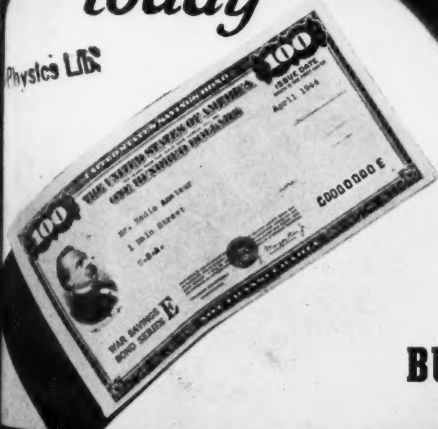
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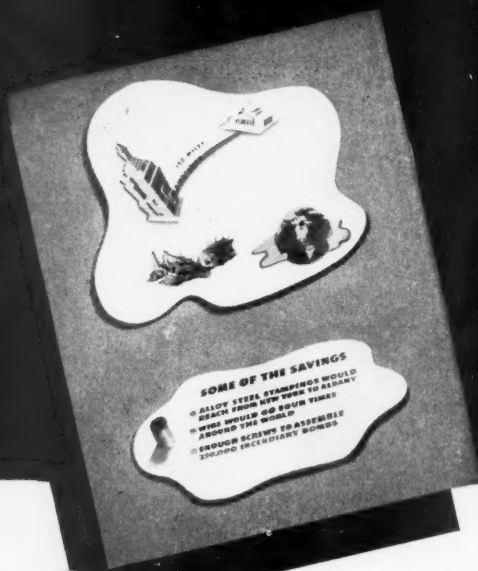
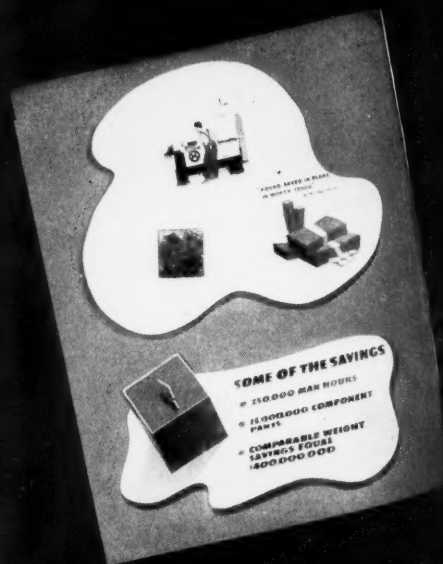
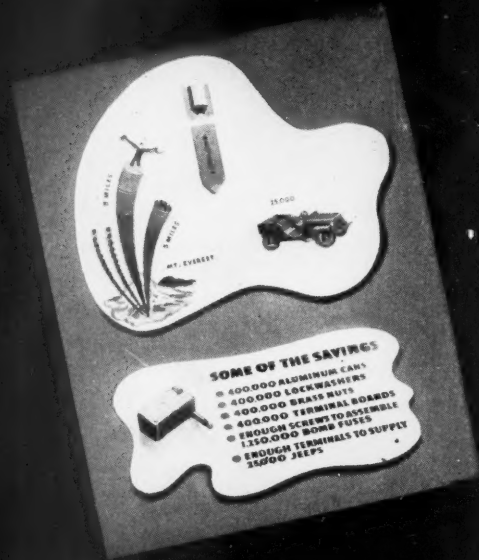
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VOLUME XXVIII

NUMBER 6



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## CONTENTS

It Seems to Us . . . . .	7
Splatter . . . . .	8
Directive Reception — An Answer to Postwar QRM? Cyrus T. Read, W9AA	9
Restoring Dry Cells . . . . . Robert N. Eubank, W3WS	11
Gold Stars — W3BSD-ex-W3BRZ, W1LQK . . . . .	15
Flying Radiomen of the Ferrying Division Lt. Col. Howard J. Haines, ex-W2EIS	16
A.C. Calculations for Parallel and Series-Parallel Circuits S. E. Spittle, W4HSG	20
Underwriters' Laboratories 50 Years Old . . . . .	24
Happenings of the Month . . . . .	25
A Self-Contained Handie-Talkie Charles T. Haist, jr., W6TWL, ex-W9EQL	28
In QST 25 Years Ago This Month . . . . .	30
Resistance and Capacitance Measurements with the V.T.V.M. . . . . A. D. Mayo, jr., W4CBD	31
Book Review . . . . .	33
In the Services . . . . .	34
Practical Applications of Simple Math — Part II Edward M. Noll, ex-W3FQJ	38
Hamdom . . . . .	41
Experimenter's Section . . . . .	42
Pre-Radio . . . . . Simpson Sasserath, Slc, USNR	43
Hams in Combat A Lady of Mercy S/Sgt. John F. Wojtkiewicz, W3GJY, W4GQJ	44
A Beginner's Station . . . . . Benjamin L. Toy	48
Amateur Broadcasting — A Menace J. K. Bach, W4CCE/3, ex-W9WGM	54
Missing in Action . . . . .	55
Silent Keys . . . . .	55
Strays . . . . .	56
Hints and Kinks A V.H.F. Converter Using a Crystal Detector — Neat Finish for Ham Gear — A Push-Pull Infinite-Im- pedance Detector — Six-Volt Soldering Irons . . . . .	58
Correspondence from Members . . . . .	60
Operating News . . . . .	63
WNYJ Stages City-Wide Demonstration . . . . .	66
The Month in Canada . . . . .	66
Amateur Activities . . . . .	67
WWV Schedules . . . . .	80
Ham-Ads . . . . .	100
QST's Index of Advertisers . . . . .	102

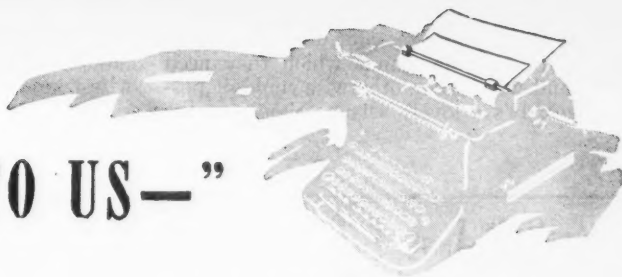
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# "IT SEEMS TO US—"



## RECIPROCITY

AFTER long months of meticulous preparation the nation and its allies have come to the days of great events. The endeavor involves what is doubtless the most concerted effort in mankind's history. It is a tremendous task for whose magnitude and complexity and seriousness we have no prior standards, the full expression of the country's might.

Participating in this vast activity are some tens of thousands of our brother radio amateurs, backed up by a similar number in essential fields at home. They have worked long and hard in preparation. They are highly skilled, magnificently equipped. They are Americans with the determination to do a job. Even, though there can be no doubt of the outcome it seems certain to be a tough job, an awfully tough one. Of one fact we can be positive: the fellows in there who are radio hams are going to give a superb account of themselves, writing heroic new chapters in the histories both of the country and of amateur radio itself.

The nation now derives great benefits from its historic policy of encouraging and protecting the institution of amateur radio. It seems to us that the wisdom of that policy can never again be challenged. It is demonstrable that the practice of amateur radio gives the free citizen of a democracy an invaluable skill to apply to the defense of the country he loves, and that the collective value of the amateur institution is so great in times like these as to be beyond price. We have been cataloging in our mind some of the major merits of this policy:

I. Foremost is the ability of amateur radio to supply personnel for the pressing needs of the armed forces and vital research and industrial work. Though their numbers are inadequate for the nation's whole needs, they are instantly available by the thousands, already skilled in a difficult art, ready to step into the early desperate situations, able to teach their know-how to others. And they possess an exceptional competency and value because their radio ability is of the sort that is born only of a real love of radio.

II. The specialized radio manufacturing industry which amateurs support in peacetime is the nucleus around which the vast wartime production of communications equipment expands. If there were not at least a small going industry experienced in the making of appara-

tus for the difficult jobs, as we have in amateur radio, that task would be unbelievably harder.

III. In the first hard days, when time is short and the need is great and the nation's factories have not had time to turn out new equipment, the huge supply of apparatus in the amateur stations of the country is available for the needs of the fighting forces, the training schools and the laboratories.

IV. Amateur radio itself being a great training school, it lends itself almost automatically to the vast training programs necessary to a war effort. Teaching personnel and instruction apparatus are immediately available. And don't laugh at this one, either: The most understandable and lucidly written technical literature in the world is that of amateur radio. Already existent when war comes, it has been found the most effective agency for really explaining radio so that new trainees can comprehend it.

V. We have saved for last what is probably the most important facet of this relationship. During war, amateur stations are traditionally closed down, for security reasons. The amateur frequency bands thereby become available to the military services during the war. Thus priceless additional blocks of frequencies come into the government's hands at a time when they are most needed for the country's preservation. If there were no amateur assignments these bands would be filled with the signals of every nation, including essential American services, and their recapture for military needs would be difficult or impossible in blocks of any appreciable width.

The amateur arrangement is really a very beautiful one for any democracy. During times of peace, when military needs and activities are small, amateurs occupy the ham bands, train themselves at their own expense, build up a reservoir of expert personnel, make important contributions to the technique, accumulate a prodigious quantity of apparatus, support a manufacturing industry, perform many public services, preserve intact the only bands of frequencies not occupied by commercial or government stations. When war comes and the bugle sounds, amateur stations are closed for security, the amateur personnel pours into the armed forces and the laboratories and training schools and factories, their apparatus is equally available for urgent initial requirements, their suppliers expand rapidly to produce complex

apparatus in unbelievable quantities, and the military services possess for the duration a family of frequency bands which they need badly and which they otherwise couldn't possibly get. It's a lovely set-up, plainly in the

national interest. The country's established practice of protecting and fostering amateur radio must commend itself to everyone as the wisest kind of national policy.

K. B. W.

## ★ SPLATTER ★

### OUR COVER

**THIS**, certainly, is one cover that requires no explanation. The moral is obvious — as obvious, indeed, as the purchase of War Bonds is both patriotic and prudent.

Already more than 55 million individual U. S. citizens have invested over 32½ billions of dollars in these vital little pieces of paper. Divide those figures by a thousand and you translate them into terms of the body of active radio amateurs. That 32½ millions of dollars we've saved (assuming hams have at least equalled the national average, and we sincerely hope they have) will mean a lot of mighty fine new ham stations after the war.

How about you? Don't you think you'd better put away the price of, for instance, a new receiver by buying an *extra* \$100 bond or two during the Fifth War Loan?

— — —

### FOOTNOTES

**THE** author's roster for this issue is unique in that it includes, on the one hand, a group of veteran hams averaging a quarter century of amateur experience, and, on the other, a 16-year-old beginner with no experience whatsoever. All, however, have plenty of good ideas that merit your attention.

**J. K. Bach, W4CCE/3-ex-W9WGM** (p. 54), is a thoughtful man who has suffered much and gained a philosophical viewpoint thereby. Unmarried, unsleazy, unhandsome (by his own description), at 37 he has resigned himself to being unloved. An erstwhile roving itinerant transmission man for AT&T, he found himself shanghaied into a staid radio operating berth at Lawrenceville in 1942. Since acquiring the ham bug he has juggled time, money, antenna, transmitter, receiver in innumerable operating contests — and won twice. Although he likes building, c.w., rag-chewing and mobile work, he views f.m. with grim suspicion. But all these tribulations fade before the one great bane of his life, a horrible occurrence which causes him to grind his back teeth in speechless rage. That, of course, is when he is called an "amateur broadcaster." . . . **Robert N. Eubank, W3WS-ex-W3AAJ**, is a veteran in several fields of radio — amateur, broadcasting and commercial. To that might also be added military, for he attended a Navy radio school for two years and served as a lt. (jg) in the USNR for eight years. From the ham angle he was SCM of Virginia for six years and RM for another two, and in addition

enjoys such distinctions as membership in the 20-Year Club, A-1 Op Club, and ROWH. A longtime ORS and holder of an ARRL Public Service certificate, W3WS was president of the Richmond Amateur Radio Club for ten years. On the professional side, after a decade as chief engineer of WRVA he joined the Virginia Electric & Power Co. as system radio technician, and has remained in that post for the past five years. It was from this vantage point that his interest in rejuvenating discarded dry cells sprouted into active research — the result (p. 11) being a typically thorough and successful ham accomplishment.

**Lt. Col. Howard J. Haines, ex-W2EIS-2QM**, is described by the public relations office of the Ferrying Division as "an authority on radio operation." This logical conclusion is based on the fact that, although still in his early forties, Lt. Col. Haines began his radio career as a ham some thirty years ago. Beginning with the pre-World War I call 2QM, he qualified for a commercial 2nd in March, 1914. In 1918 he joined the Air Service Section of the Signal Corps, was commissioned a 2nd lt. wing radio officer, and was assigned to the 295th Observation Squadron. After World War I he remained in the Air Corps Reserve. He was an engineer with Western Electric in New York until recalled to active duty in 1942 as communications officer with the ferrying organization of the ATC. While he is now assistant director of administration at Headquarters, Ferrying Division, his duties as director of radio training continue to occupy much of his attention. In that capacity he implements the basic policy of the Ferrying Division — to assure safe delivery of the planes handled by the organization. Advanced training of flight radio operators is a vital phase of that program, as explained on p. 16. **Charles T. Haist, jr., W6TWL**, is practically a newcomer by comparison with the rest of this month's circle, having been in the ham game only some fifteen years. First licensed as W9EQL, his amateur activity led to a B.S. degree in EE when he subsequently went to college. Migrating to the West Coast five years ago, he went to work for the Boeing School of Aeronautics and the United Air Lines training center at Oakland as chief radio communication instructor. There he instilled electrical and radio theory and lab training into Army students from the Air Transport Command. When this training was discontinued the first of the year he took on an electrical design engineering job for a special research program of the kind you don't talk about. We'd say it was a logical assignment, judging his designing ability by the WERS handie-talkie on p. 28. W6TWL has another WERS unit, by the way —

(Continued on page 96)

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# Directive Reception—An Answer to Postwar QRM?

*A Problem for the Experimenter*

BY CYRUS T. READ,\* W9AA

THE history of amateur radio has been a constant struggle between growing congestion in the amateur frequency bands and corresponding technical improvement in amateur equipment to relieve that congestion. Every major increase in the amateur population has been accompanied by the introduction of new apparatus or methods to accommodate it.

It seems fairly obvious that, when amateur operation is resumed after this war, there will be a considerable increase in the number of licensed hams. In addition to the prewar amateurs—most of whom, it is certain, will be back—several thousand new operators have been licensed by the FCC since Pearl Harbor. Many thousands more, trained by the Army and Navy, will want to go into ham radio. In consideration of these facts it appears that, if amateur radio is to maintain or improve its prewar condition of relatively light QRM, a further major advance in technique will be required.

## *Keeping Up with the QRM*

The fact is that, actually, interference conditions prior to the suspension of amateur operation in December of 1941 were not so severe as those which prevailed in the last years of spark transmission. Early amateur spark transmitters, while theoretically operating on 1500 kc., actually occupied a band of frequencies several hundred kilocycles wide. The adoption of rotary and quenched spark gaps and inductively coupled oscillation transformers which afforded some measure of tuning helped to relieve the situation, but it was not until the introduction of vacuum-tube transmitters in the early 1920s that any real progress in sharpening the signal was made. Since that time there have been many refinements in transmitter design, culminating in the modern crystal-controlled rig with pure d.c. plate supply which represents the present ultimate in spectrum economy. The development of sharper tuning in receivers went hand-in-hand with that of transmitters. Starting out with direct-coupled tuners and crystal detectors—a combination possessing almost no selectivity—amateur stations progressively adopted loose-couplers, audion-tube detectors, regeneration, tuned r.f. amplifiers, the superheterodyne and, finally, the single-signal receiver.

Of necessity, the object of this continuous development has been to make room for an ever-

increasing number of stations within the narrow limits of the amateur bands. As a result, periods of maximum increase in the number of licensed amateurs have generally coincided with major advances in amateur technique. Specifically, the period between the reopening of amateur operation in 1919, when approximately 5000 stations were licensed in the first rush to get back on the air, and the summer of 1921, when the number had more than doubled, was immediately followed by the general adoption of continuous-wave transmitters and regenerative receivers of improved stability and selectivity. Again, in the early '30s, when the amateur population was nearly trebled and activity reached unprecedented levels, only the general change-over to crystal-controlled transmitters and superheterodyne receivers averted chaos.

While the desire for technical progress is a natural process of technical evolution, it has been the traditional policy of the ARRL to promote large-scale programs for the development and popularization of new techniques whenever the need for such progress became evident. In keeping with this long-established policy, the purpose of this article is to suggest a possible new approach to the coming problem of postwar amateur congestion.

## *Directional Selectivity*

A logical starting point for solving a problem of this nature is, if possible, to find a previously undeveloped point of attack. We believe that an investigation of directive reception offers such a point of attack.

Every signal heard on a radio receiver has two fundamental characteristics which serve to differentiate it from other signals. One of these is its frequency; the other, the direction from which it is received.<sup>1</sup> The problem of interference heretofore has been attacked almost exclusively from the standpoint of receiver selectivity, but it is now generally believed that the practical limit in that direction has been reached. Since the introduction of the single-signal receiver in 1932 there has been no major improvement in r.f. selectivity, nor is there likely to be. A modern receiver with a crystal filter adjusted for maxi-

<sup>1</sup>Other less basic differences which could conceivably be employed to discriminate against unwanted signals, such as amplitude, phase and type of modulation, are disregarded here inasmuch as, in the present state of the art, they offer no obvious avenues of attack in solving the problem under consideration.

\* Assistant Secretary, ARRL.

mum selectivity has a band-width of less than 100 cycles. Any lesser width would necessitate an unreasonably high degree of stability in the transmitter and the high-frequency oscillator of the receiver, apart from limiting the permissible modulation width to undesirably low keying speeds.

The possibilities of directional selectivity, on the other hand, have hardly been touched. While truly directional arrays were commonly used for both transmission and reception on the very-high frequencies, amateur operation on the 1.7-, 3.5-, 7-, and 14-Mc. bands has been largely non-directional or has made accidental use of the fixed directional properties inherent in all horizontal antennas. It is true that a fairly large number of 14-Mc. stations used rotatable beam antennas, but these simple arrays, while giving satisfactory performance in terms of power gain in transmission, did not provide any great order of directional selectivity for reception. Since multi-element arrays for the lower frequencies were obviously impractical and rhombics and other forms of long-wire directional antennas, while useful for special purposes, were not adaptable to general amateur operation, the achievement of genuine directivity in reception remained unfulfilled.

#### ***Wanted: A Direction Tuner***

What amateur radio really needs is a simple, compact device that will permit directional reception on the lower frequencies of an order comparable to that obtained on the very-highs with an elaborate beam array. The tremendous improvement in amateur operating conditions which such a development could make possible can hardly be overestimated. The introduction of the crystal-filter circuit in communications receivers is not comparable, because a fair degree of r.f. selectivity already was in use at the time; directional selectivity, on the contrary, up to now has been almost nonexistent.

The ideal "direction tuner" would be a device, completely non-critical as to frequency, but with a "geographical band-width" of only 10 or 15 degrees of arc. Using this device in conjunction with a modern single-signal receiver, the amateur operator would be able not only to select a band of frequencies less than 100 cycles wide, but could separate that band into 24 directionally different parts. Theoretically, it would provide 72,000 c.w. channels in the 7-Mc. band — more than one channel per amateur station, based on the number licensed in the United States at the outset of the war.

How to accomplish these highly desirable results is the problem to be solved. Under normal circumstances the laboratory crew at ARRL Hq. would now be hard at work, exploring every promising idea on the subject that came along. The manpower requirements of war have, however, decimated that crew to the point where any very extensive research is beyond its present capabilities. It is realized that the vast majority of amateurs are likewise too busily occupied these days

to undertake any such program, but it is hoped that some few may be found with a little time to devote to a subject that offers such great possibilities.

#### ***Possible Methods***

It is likely that there is no single, simple solution; rather, the answer very probably will be found in a combination of well-known radio principles in some new and unusual manner. A good first step would be an investigation of the various arrangements now known to have directional properties on the lower amateur frequencies. Broadcast stations commonly make use of controlled phase relationships in vertical radiators to provide directional transmission, and a few elaborate amateur installations have used similar arrangements. A discussion of this method by B. Penners, W7HLV, appeared recently in *QST*.<sup>2</sup> Small rotatable loops, larger fixed loops coupled through a goniometer, multi-element rotatable arrays, physically small but with provision for resonating the elements on the lower frequencies — all of these methods offer possibilities. The use of arrays made up of vertical spaced elements with controlled phase relationships might prove practical if the elements were reduced in size and then loaded.<sup>3</sup>

In their present form none of these arrangements provide the critical directional properties that are needed to do the job right, but it is possible that a non-linear amplifier could be used to accentuate the apparent directional properties of any of them. This type of amplifier, in contrast to the ordinary Class-A r.f. amplifier, does not increase its output in direct proportion to the voltage applied to its grid but has a greatly increased output when the exciting voltage is only slightly increased.

There may seem to be good, sound reasons why a practical means of securing true directional selectivity can not be developed — but don't forget that there also seemed to be good, sound reasons to prove that hams would never get out of their own backyards on 200 meters. In the past, radio amateurs have never been noted for their meek acceptance of technical limitations and the record being made by amateurs in technical posts in the present war gives no indication that they have changed.

Discoveries and improvements far more revolutionary than directive reception have resulted from coöperative amateur effort in years gone by, and this problem is accordingly presented as a fit subject for amateur research and experiment. The ham who finds an answer to it will be making a big contribution to postwar amateur radio. *QST* will, of course, welcome comments, suggestions, and progress reports.

<sup>2</sup> Penners, "A Directive Antenna for the Low Frequencies," *QST*, February, 1944, p. 40.

<sup>3</sup> There is a great deal of published literature on the subject of directive antennas, although most of it is of a highly mathematical nature. From the amateur's standpoint, *The ARRL Antenna Book* and the chapter on antennas in Terman's "Radio Engineering" probably will prove most useful as references.

# Restoring Dry Cells

*A Method of Multiplying Normal Battery Life*

BY ROBERT N. EUBANK,\* W3WS

In this article W3WS describes the achievement of a long-sought goal — a successful method of charging used dry cells by the application of a counter-e.m.f. as in recharging storage cells. By correct employment of this system, useful service life may be increased from 10 to 25 times at negligible cost.

EVER since the first vacuum tubes became available amateurs have been searching for a means of renewing the life of discharged dry cells. In the early days of ham radio the pure-tungsten filament of only a single tube was practically a short-circuit across three dry cells in series. Most tubes drew anywhere from 1 to 1½ amperes before they would get down to business. Some of the more fortunate amateurs of that day managed to acquire storage batteries and chargers, but many had to depend upon the No. 6 dry cell. These could be obtained only at garages, since they were then being used to a considerable extent in automobile ignition systems.

The average life of a No. 6 cell under the conditions of those days was a matter of only a few hours, so that even a one-tuber had to be operated sparingly. It always seemed a shame to throw a discharged cell into the ash can when,

from all outward appearances, it was as good as new. So the used cells would collect in a corner of the basement or gradually overload a shelf, periodically prodding the owner into an attempt to devise some way of squeezing a few more hours of life out of them. It was found that heating the cells in an oven sometimes would bring them back for a brief period if they had not been run down too badly. Another popular stunt was to bore several vertical holes in each cell and fill them with anything from copper sulphate to vinegar. Saline solutions from various sources also were tried. However, very few of the many ideas which were brought forth bore sufficient fruit to make the effort seem worth while.

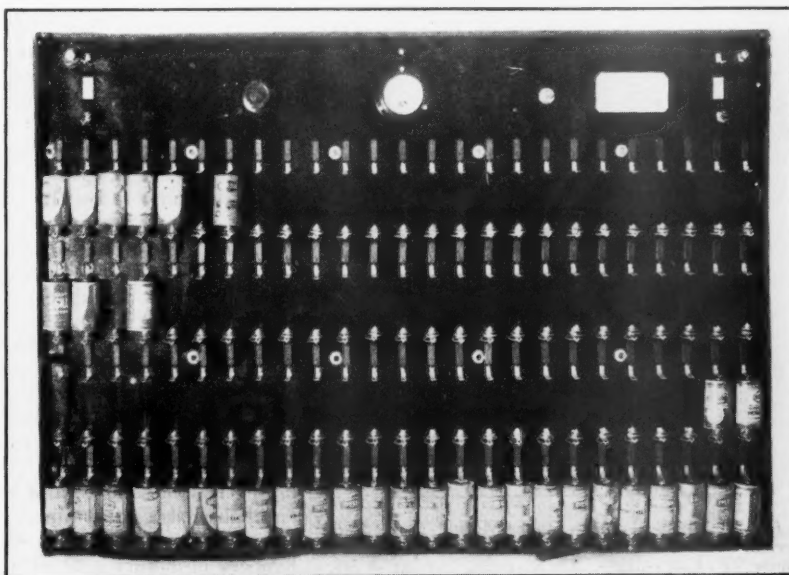
Of course, in these modern days of a.c. tubes we do not have the problem of replacing filament batteries except in some types of portable and emergency gear. But dry batteries are still used by the millions for other purposes. At the present time batteries for civilian use are very scarce because many critical materials, such as zinc, Shawinigan Black, Monsato Black, Cabot Black and manganese, are required in their manufacture.

## Prior Research

Some time ago the author decided to determine what might be done toward reclaiming worn-out dry cells by a process of restoring similar to the method commonly used for storage batteries. A search for suitable reference material showed that little had been written on the subject. Perhaps the

\*1227 Windsor Ave., Richmond, Va.

This commercial-type dry-cell restorer has a maximum capacity of 100 units per day or 36,500 per year. It is 35 inches wide, 24 inches high and 6 inches deep. The cells plug into spring clip connectors.



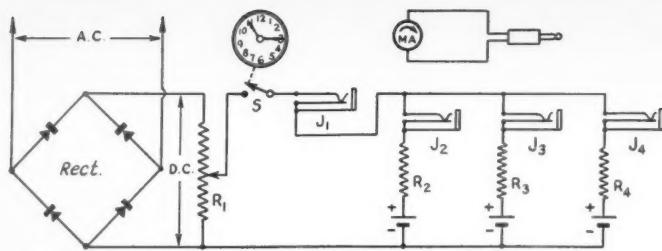


Fig. 1 — Circuit diagram of the experimental dry-cell charging arrangement.

R1 — Potentiometer, 25 to 50 ohms per rectifier output volt.

R2, R3, R4 — 20 to 30 ohms, 1-watt, per cell.

J1 — Master meter jack for checking total line current, closed circuit.

J2, J3, J4 — Meter jacks for checking current to individual cells, closed circuit.

MA — D.c. milliammeter.

S — Clock-operated switch.

most encouraging was a paper presented before the Electrochemical Society in 1938. This paper described the effect of applying a counter-e.m.f. to a wet battery of the Leclanché type. Numerous tests showed that cells which had a normal life of about 70 ampere hours could be restored several times to give a total of 350 or more ampere hours. While some of the cells had to be restored as many as ten times to obtain this extension the service life probably could have been increased still more, since the cells were still in a healthy condition at the conclusion of the tests.

A search of the U. S. Patent Office records disclosed several patents relating to the recharging or restoring of dry cells. The methods described varied widely, but all applications claimed positive results in one degree or another. One patent was considered of sufficient value to be bought by four of the manufacturers of present-day portable radio receivers, while still others were assigned to battery manufacturers. Upon further investigation a few were found to be in limited current use. However, in all cases specific recommendations as to charging procedure for maximum extension of life were lacking.

Most of those with whom the project was discussed were of the opinion that the recharging of dry primary cells was more or less impossible because it would be necessary to replace basic materials in order to obtain additional cycles of operation from them. In the light of subsequent inves-

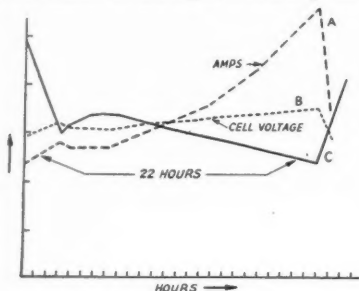


Fig. 2 — Typical curves taken during a restoring period. (A) Readings taken with a standard battery ammeter. (B) Cell voltage. (C) Restoring current in ma.

tigation, however, it seems that these opinions were based upon misconceptions which somehow have found more or less universal acceptance in years past. The general impression has been that the active materials comprising the cell, especially the negative zinc electrode, disintegrate as the battery is used. By the

time the voltage of a cell dropped from a normal value of 1.5 to about 0.9 volt it was assumed that sufficient zinc had been eaten away to render the cell useless. At the same time it was recognized that failure of the depolarizer also was a factor.

As a starting point in the investigation, several worn-out cells were cut open and examined. Out of twenty cells only one showed pitmarks on the inside of the zinc can of sufficient depth to be felt with the hand, while two others showed erosion which could be detected by running a scribe over the inside surface. With this evidence at hand, it seemed quite apparent that deterioration of the zinc was not the chief factor responsible for limiting battery life.

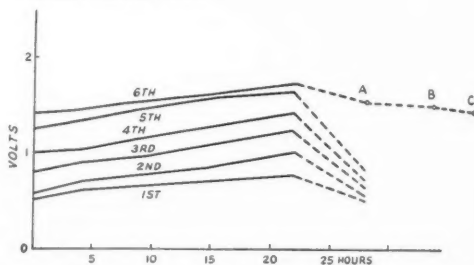


Fig. 3 — In some cases, it is necessary to put a cell through several restorations. Note how the voltage falls off rapidly after a service of 25 hours until after the sixth charging period. Point C indicates voltage after 30 days' use at 5 minutes per day.

### Experimental Set-Up

In order to obtain some experimental data on the effects of a charge by means of a reverse current through worn-out cells, the arrangement diagrammed in Fig. 1 was set up. It consists chiefly of a copper-oxide bridge rectifier with an adjustable voltage divider across the output. Jacks were provided at the points shown so that charging-current readings could be taken at intervals. Low resistances were placed in series with each battery. After some experience had been gained the clock-operated switch, S, was inserted to terminate a charging period automatically.

For testing both new cells and old cells after charging, voltage readings were taken with normal load across the battery with a standard Weston battery-testing voltmeter, and discharge-current and ampere-hour readings were taken with a standard ammeter. A light meter, calibrated in foot-candles, also was used in testing flashlight cells against time.

In order to attempt an explanation of what happens inside dry cells when they are charged,

several independent analyses of cells were obtained from chemical laboratories. New cells, discharged cells and recharged cells were analyzed.

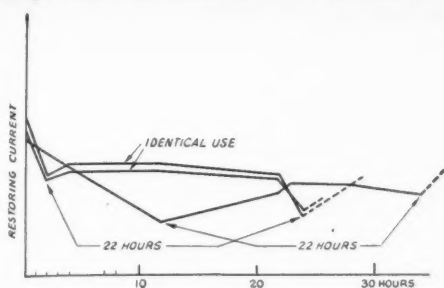


Fig. 4—A comparison between a pair of cells which had been discharged in series with one which received different treatment during the discharge period.

The most significant part of the reports relates to the manganese dioxide which is used as the depolarizer in all dry batteries. The examinations showed that a new cell consists of 78 per cent manganese dioxide, while a dead cell consists of only 58 per cent. A partially restored cell showed 67 per cent manganese dioxide. It was determined further that the manganese dioxide is reduced to a monoxide during discharge. Charging with a reverse current results in a return to the original dioxide form.

The results of the initial investigation, in which 300 cells of various types were put through many charge and discharge cycles, established conclusively the practicability of charging dry cells by the reverse current method, provided correct procedures are used. It was found that, with proper handling, surprising increases in normal dry-battery life are possible at small expense. A very large percentage of discharged cells can be restored to serve from 10 to 25 times their normal life at a cost of only a fraction of a cent per cell using simple and inexpensive equipment.

#### Procedure

Two different sizes of restoring panels designed for commercial use of the method, which is patented, are shown in the photographs. A ten-unit restorer will handle 2600 cells in a 5-day week. In addition to the controls and meters, clips are provided so that cells may be placed on or taken off charge without interrupting the charging process.

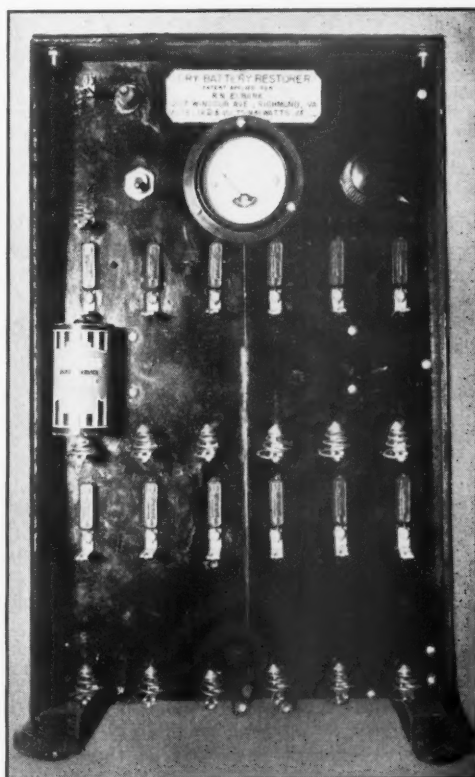
The secret of success in applying this method lies in the procedure—correct charging periods and rates for cells of various types and employed in different services, and developing a technique of selecting cells capable of being restored.

Since the condition of individual cells varies widely, it was found preferable to charge them in parallel unless they have been discharged in series. However a poor cell in series with several good ones may prevent the latter from taking a normal charge. With parallel restoring all units should, of course, be of the same voltage rating, although it is not necessary that the actual terminal voltage when discharged be the same.

One of the most interesting (and valuable) points brought out by the series of tests is that the proper length of the restoring period can be determined by observing the restoring current. After the restoring rate has been set initially it should be readjusted for the entire restoring period. Fig. 2 shows curves for a typical cell. It will be observed that the restoring current decreases quite rapidly for the first few hours. The curve then flattens out into a more or less horizontal line, until a point is reached where there is an abrupt increase in restoring current. Experience has shown that the restoring period is complete when this point of sudden current change has been reached. Charging beyond this point results in an actual decrease in the cell's renewed life.

#### Charging Rate

While batteries may be charged at an initial current rate as low as 1 ma., the charging period will be shorter if the rate is increased. The maximum rate at which a cell should be charged varies with the size of the cell although the total time to bring the cell back to maximum charge does not, providing the cells have received approximately the same treatment during service. Fig. 4 compares the restoring current of two cells which were in approximately the same service during discharge with one which received different treat-



A 12-unit dry-cell restorer. It has a maximum capacity of 12 units per day or 4320 units per year. It is 9 inches wide, 15 inches high and 6 inches deep.

ment over the discharge period. Experience has shown that the following starting rates should not be exceeded:

No. 6.....	15 to 25 ma.
F Size ( $1\frac{1}{8}'' \times 3\frac{1}{2}''$ ).....	10 to 15 ma.
D Size ( $1\frac{1}{8}'' \times 1\frac{1}{2}''$ ).....	7.5 to 10 ma.
C Size ( $\frac{3}{4}'' \times 1\frac{1}{8}''$ ).....	5 to 10 ma.
Penlite ( $\frac{1}{2}'' \times 1\frac{1}{2}''$ ).....	5 to 7.5 ma.

The initial restoring current for smaller cells should not exceed 3 ma.

"B" batteries may be restored successfully, provided the block contains no defective cells. If a "B" battery does not react well, it may be taken apart and the poor cells removed. If the battery has a rated service life of 1000 hours or one year in the receiver, it should be charged at 500 hours or at the end of six months.

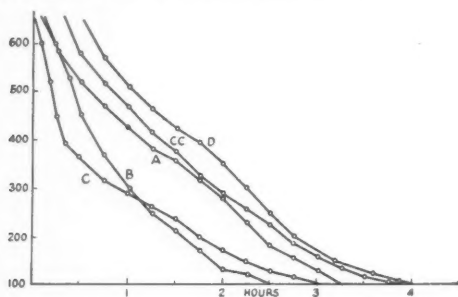


Fig. 5 — Curves showing discharge characteristics of new cells and cells after restoration. The output was measured with a light meter in a manner similar to the photometric method of measuring r.f. power. Curve A is the curve for the average of several new cells tested the same day they were purchased. Curves B and C are for cells after the first restoration. Curve CC is for the cell of Curve C after a second restoration. D shows the performance of a bargain-store cell after reactivation.

Before attempting to charge a cell, it should be examined for obvious defects. Cells which are found to be in a condition corresponding to any of the following categories probably will not respond well to charging, although the only way to tell conclusively is to try charging.

- 1) Cells whose case cover does not slide off (if of the loose type).
- 2) Cells which are swollen or bulging.
- 3) Cells with perforations in case.
- 4) Cells over two years out of date.
- 5) Cells which show signs of chemical action on outside.
- 6) Cells which have remained idle for long periods after discharge.
- 7) Cells which will not light normal load bulb at all.
- 8) Cells below 60 per cent of rated voltage under normal load.

Cells which have been operated frequently or continuously at or near maximum rated load react more favorably than those which have seen long service at a light discharge rate. A good cell which had been short-circuited for 4 hours was brought back to give normal service life. This is true also of cells which have remained idle for

long periods after discharge. It is preferable to start restoration within 24 to 60 hours after the cell has been removed from service.

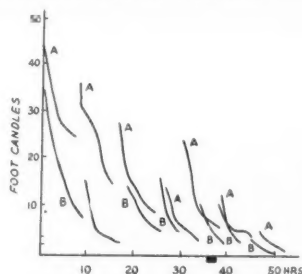


Fig. 6 — Total useful service hours on intermittent use of 6-volt lantern batteries. Curves A are for the cells after the first restoration, while those labelled B were made after the second restoration period.

Good cells react in a fairly uniform length of time, so that it is possible to follow the general rule of placing all cells on hand on charge for a 24-hour period. Cells which have not reacted well at the end of this period should be given a rest for 24 hours, after which the charging period may be repeated. Some cells will not show normal reaction until they have been given as many as eight restoring cycles.

Restored cells should not be replaced in service until a period of 6 to 24 hours has elapsed after they have been taken off charge. However, they should be placed in service as soon as possible after the 24-hour rest period. If this is not possible, maximum life will be obtained if the cell is loaded normally for five minutes out of every 24 hours during which it is idle.

### Service Life

Good cells may be recharged several times. Figs. 5 and 6 compare several cells before and after restoration. The useful life after the second charge is often longer than the initial life before charging. After the second charge, the time between charges is gradually reduced. Some cells have served through a series of as many as 35 charge-discharge cycles.

In the cases of cells which have had normal treatment during their original discharge periods, 50 to 75 per cent of their original service life is

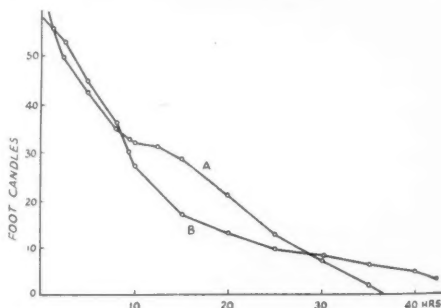


Fig. 7 — Comparison of performance of (A) a new cell which had not received treatment and (B) a new cell which had been given a charge before being placed in service. Curves are for continuous discharge.

usually obtained after the first restoration, 65 to 110 per cent after the second restoration, and 60 to 95 per cent after the fourth. With correct treatment 75 to 90 per cent of all used cells can be restored to give ten to twenty-five times original service. On the average, the life to be expected from charged cells will be in direct proportion to the length of life obtained when the cell was new.

Even the initial service life of new cells may be increased, especially if they have been on the dealer's shelf any appreciable length of time. A comparison between an uncharged new cell and one which has been charged before being placed in initial service is shown in Fig. 7. Life extensions of from 25 per cent for new cells which had been on the shelf for 6 months to 10 per cent for those idle for 60 days have been obtained.

A comparison between the charge and discharge portions of a cycle is shown in Fig. 8. Restored

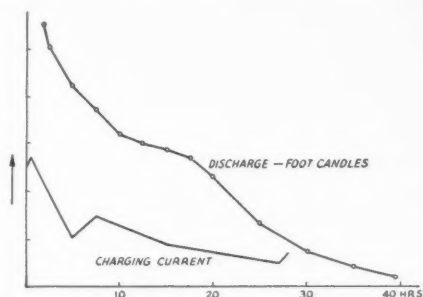


Fig. 8—Curves comparing charge and discharge portions of a restoration cycle.

life in dry cells does not depend upon the ampere-hours of charge, as it does in the case of a storage battery. With a charge equivalent to 0.25 to 1 ampere-hour, as much as ten times that output may be obtained in service. The cost of power for charging therefore is negligible, even at home rates of 5 cents per kilowatt hour. The cost to restore a single cell will average between one-tenth and one-quarter of a cent. In practice, three hundred cells have been rejuvenated at a cost of twenty-three cents. Several large consumers of dry cells have been able to save appreciable sums of money by the use of restorers of this type.

#### Bibliography

Kobe and Graham, "The Effect of Applying a Counter E.M.F. to a LaClanché Cell," *Transactions of the Electrochemical Society*, Columbia University, Vol. 73, 1938, p. 587. Also *Proceedings Preprint 73-3* and discussions.

Vilkomerson, "Rejuvenating Dry Batteries," *Radio-Craft*, July, 1941, p. 51.

Ghirardi, "A Radio Physics Course," second edition, p. 82.

U. S. Patents: F. T. Bowditch, 1,846,246; W. F. Skinner, 2,199,322; B. S. Vilkomerson, 2,222,196; C. Hambuechen, 1,954,931; L. M. Siemon, 2,036,547; A. E. Oswald, 2,000,571; S. B. Hess, 1,306,147.

French Patent: 722,761. British Patent: 274,907.



## Gold Stars

SGT. WILLIAM T. BETTS, JR., W3BSD-ex-W3BRZ, 37, died in December, 1943, when the Army cargo ship on which he was the radio operator sank from the battering it had received during a five-day storm in the North Atlantic. He

and the captain were the last to leave their sinking ship. As their lifeboat was launched a wave capsized it, causing all aboard to be drowned.



Although the standard radio equipment on the ship had been swept away by the storm, before it sank W3BSD rigged up emergency gear to send an SOS which resulted in the rescue of 29 crew members

when their lifeboat was picked up by a Coast Guard cutter which had heard W3BSD's signals.

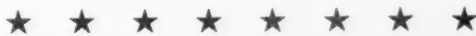
Immediately after Pearl Harbor Sgt. Betts attempted to enlist in the Navy and later in the Army, but in each instance he failed to pass the physical examination. At his own expense he underwent an operation to correct his disability and then was accepted in the Signal Corps, volunteering for sea duty.

FRANK J. BEDNARZ, ARM2c, USNR, W1LQK, 24, was killed in an airplane crash in the British West Indies on January 10, 1943.

W1LQK received his ham ticket in 1934 while in high school and after operating for several months he joined the NCR. Called to active duty in March, 1941, he reported to the Navy's Noroton Heights, Conn., school for a four months' course. After completing training he received the rating of radioman third class and was assigned to the destroyer U.S.S. *Howard*. Several months later he reported to the Norfolk Naval Air Station for flight duty and served as radioman in a patrol squadron at Panama and Bermuda until the time of the crash.



Frank held an appointment as ORS and was a member of the Rag Chewers' Club. He was a member of the Nutmeg Net and also operated in the ARRL Emergency Corps, serving during both flood and hurricane disasters.





# Flying Radiomen of the Ferrying Division

**Duties and Training of Flight Radio Operators of the Ferrying Division, ATC, AAF**

**BY LT. COL. HOWARD J. HAINES,\* EX-W2EIS**

*Left* — The author, ex-W2EIS, at his desk at Ferrying Division Headquarters in Cincinnati. As director of radio training for the Ferrying Division he is in charge of the Advanced Radio Training Unit.

*All Official Ferrying Division Photos*

**T**HIS war has brought great strides in the development of aircraft radio communication and navigation. The U. S. Army has great accomplishments to its credit in this field, and not the least of these is the way thousands of men have been finely trained to operate the new instruments. A notable example of such achievement by Air Forces schools is the work of the Advanced Radio Training Unit of the Ferrying Division, Air Transport Command.

To understand the work performed by this Unit it is necessary first to know that the Ferrying Division of the Air Transport Command delivers to Army air bases throughout the world most of the aircraft manufactured in the United States for the AAF, and in addition handles the movement of aircraft manufactured for lend-lease to the United Nations. Operations of the Division extend throughout the world and include regularly scheduled transport service between Florida and India over the longest such route in existence — a distance of 14,000 miles.

As background it may be noted that the Air Transport Command itself is an outgrowth of the original Ferrying Command. Created in the summer of 1941, the initial function of the Ferrying Command was that of delivering to Canadian airports lend-lease aircraft being manufactured in this country for the British. Shortly thereafter it was given the additional assignment of carrying diplomatic mail and important personnel between the U. S. A. and the United Kingdom.

\* Division Communications Officer, Headquarters, Ferrying Division, 309 Vine St., Cincinnati, Ohio.

ARTU students get post-graduate training in code . . .



After U. S. entry into the war the functions of the Ferrying Command multiplied, and in July, 1942, it was reorganized as the Air Transport Command. Eight separate wings of the ATC now perform varied duties ranging from administering priorities for air travel to flying vital cargoes of military freight to focal military points all over the globe. The renamed Ferrying Division still performs its original function of ferrying military aircraft, however.

Another major activity of the Division is conduct of most of the Air Transport Command's training program. Advanced radio training is one of the important phases of that program, as developed by Brig. Gen. William H. Tunner, commanding general of the Ferrying Division — a graduate of West Point who, incidentally, at the age of 37 holds a command pilot rating.



. . . and lab to qualify them for their specialized jobs.

## **Flight Operators vs. Ground Operators**

With the development of the stepped-up air program for World War II, it was early discovered that a vast difference existed between the qualifications required for ground radio operators and those for flight radio operators.

The Ferrying Division lost no time in correcting this difference by establishing its own schools

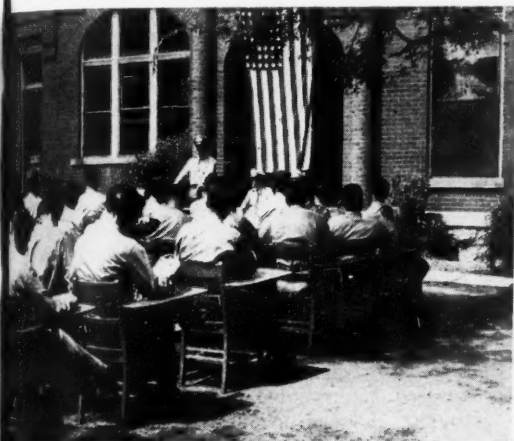
**QST for**

for the specific purpose of training ground radio operators for duty in the air.

Men who can successfully pull signals out of the air while sitting on *terra firma* require altogether different training if they are to be able to do the same thing successfully while in flight. The physical requirements also are different; the airborne operator must have the same physical characteristics as the pilot and navigator.

Furthermore, the flight radio operator must know many things the ground operator seldom hears about. One of the most important of these is radio navigation, a facility which has saved the lives of many airmen in the past two years.

The 60-day course ends with graduation exercises . . . and the class leaves for points all over the globe.



established — one at Nashville, Tenn., and the other at Long Beach, Calif. At these schools a 60-day advanced course — given under the direction of prominent former amateurs — quickly produced some of the finest flight radio operators in the world.

The demand for these especially trained men continued to grow, and recently the Nashville and Long Beach schools of the Advanced Training Unit were combined in the one large school located at the Reno Army Air Base in Nevada. At this school the student completes a 30-day ground course and then spends fifty hours in one of three especially equipped aircraft working out radio problems in the air. Many improvements are constantly being added for the benefit of the students and the 60-day course is a pleasant one.

### Flight Duties

Upon completion of the advanced training course the student is assigned to one of the eight Groups of the Ferrying Division. There he joins a flight crew which may take him over all of the routes of the Air Transport Command throughout the world.

The flight radio operator's duties begin when the plane leaves the field, and from then on he keeps a constant radio watch until the wheels of the plane touch the ground at one of the many far-flung airfields of the ATC anywhere on the globe. During the flight he will receive at regular intervals time checks and weather reports for the

Prior to the war there had been little development of radio navigational aids over the long routes across the oceans. Most overwater air travel was accomplished in the traditional manner — by employing celestial navigation. But celestial navigation, which is a function of the navigator, depends upon a good sight of the stars, and such a sight cannot always be had in fog-bound areas such as are common along the North Atlantic routes.

Fortunately, however, there had been developed good automatic direction finders with which our larger planes were equipped, thereby enabling our radio operators to establish their position by triangulation. Thus our flight radio operators — apart from supplying radio communication — proved invaluable in providing position reports which enabled the navigator to establish a compass course along which the ship could fly to its destination.

A program for providing flight radio operators with the specialized training required for their satisfactory performance of this and other duties was developed by the Groups of the Ferrying Division located at nine major fields throughout the United States. It was from these fields that aircraft left the continental United States to fly overseas to the combat areas.

To satisfy the heavy demand for qualified flight radio operators two major schools were

WAC code instructors help ARTU students to boost code speeds and learn finer points of operating procedure. Here Sgt. Carol A. Briggs is shown sending a practice transmission from a student's operating position on a code-room practice table.





When the ARTU schools at Nashville and Long Beach were consolidated at the Reno Air Base, the WAC code instructors from the Nashville school got some actual experience as flight radio operators aboard the convoy of C-47 transports which transferred the personnel and equipment to the new school.



information of the navigator and pilot. He will depend upon the liaison transmitter, rated at 75 watts, to contact ground stations over enormous distances. To aid the navigator he will take frequent bearings on radio stations which serve as a double check on the plane's position as plotted by the navigator.

The traditional ingenuity attributed to radio amateurs was aptly illustrated in the early days of the war by one flight radio operator—a former ham—who used his head to save a valuable airplane and its crew. He was aboard a four-engine bomber approaching the West Coast across the Pacific. For some reason or other the electrical system on the bomber had cut out. At the time the Pacific Coast was in a highly alerted state, and detecting apparatus at scores of ground installations soon picked up the drone from the motors of the big ship. But the aircraft remained unidentified; without power its radio transmitter, of course, was dead. Soon the big plane was located by numerous searchlight batteries, and fighting planes were ready to shoot it out of the air.

The situation was grim. There seemed to be no means of signaling their identity, and the pilot gave up all hope of making a safe landing. Then the radio operator remembered the emergency radio transmitter—the famous Gibson Girl, an emergency hand-powered rig intended for use in rubber boats when down at sea. Quickly assigning the flight engineer the job of cranking for all he was worth, the flight radio operator tapped out their assigned identification signals. Only his prompt action prevented the otherwise certain destruction of the plane and its crew.

### Hams in the ARTU

Hams dominate the radio training program of the Ferrying Division. Capt. Richard T. Parks, ex-W5AB, communications officer at the Long Beach Base and staff advisor to the present school at Reno, has held a variety of amateur calls. While engaged as a pilot for Pan American Airways he used the call OA4G in Peru and CE3EL in Chili. Capt. Hale P. Farris is a well-known 80-meter ham from Wilmington, Delaware.

The instructing group at Reno includes many hams. For instance, T/Sgt. Seymour Mackoff served in Army radio since 1939 in the air and with ground stations. His experiences carried him to Panama, Trinidad, and British Guiana. He installed GI radio equipment in a captured

Italian Savoia-Marchetti transport in British Guiana and flew it to the U. S. for exhibition purposes. S/Sgt. Mylus O. Sharpe has spent three years with AAF radio, having been trained by the Hawaiian Air Force. His experiences on missions into enemy territory brought him the DFC and Air Medal with oak leaf cluster for Pacific duty. Sgt. Norman F. Miller, holder of a Class A amateur license, owned station W3CRR, Allentown, Pa., from 1930 on. He worked at K5AF, Albrook Field, Canal Zone, as QSL manager and also served with WFA

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After the WAC radio instructors of the Ferrying Division landed at the Reno Air Base (opposite page, below) they shed flying togs and immediately went to work helping the male instructors get the school in operation. *Top to bottom* — (1) Two WAC sergeants inventoried supplies. (2) A WAC corporal helped check lab equipment. (3) Another sergeant and a male co-worker installed code-practice tables. (4) ARTU administrative personnel moved into their new section.

at Albrook Field. Cpl. Eccles L. Gossert, jr., with a Class B ham license had his own station W4FSQ, at Ft. Bragg, N. C. He also operated at W4EZH and K5AY, in addition to Army stations WVJ, WVN and WAR, and was a chief operator at sea for a year. Pfc. Jacob S. Saperstein, W2IMN, of Newark, N. J., holds a Class A ham license, has served as president of the Amateur Club of Newark and is a member of the Bloomfield Radio Club. Pfc. Frank Colvert, W4DOP, a ham since 1930, has a Class A amateur license. Before the war he worked at WPTF, Raleigh, N. C.

The ARTU instructors are among the world's finest. Each is a qualified, experienced radio operator in his own right and has been carefully chosen because of his ability to impart his knowledge to the students.

### ARTU Training

Every man who enters the ARTU is a graduate of a basic radio school and many of the students have had previous experience on foreign flights. The ARTU, however, goes into greater detail than do the basic schools and the operators learn the latest developments in radio technique. Their errors are ironed out by the ARTU.

Radio navigation is taught so thoroughly that a graduate of ARTU is fully capable of bringing a plane safely to a base on his own when called upon to do so. In fact, one of the ARTU alumnus did that very thing on his graduation trip. Flying under conditions which made celestial navigation impossible, the radio operator took triangulation bearings on known radio stations and secured a position reading. By making progressive readings the operator brought the plane safely to its destination.

The training given at the school accents the importance of flight radio operation and stresses upon the student the fact that his training there may mean the difference between life and death at some future date.

The ARTU course is of six weeks duration with eight hours of daily classes, six days a week. Only the most capable receive graduation certificates, and "washouts" are not uncommon. The reason for a student's washing out may be either academic or physical.

ARTU classrooms are not confined to mere blackboards and charts. Every classroom is fully equipped with a variety of radio instruments in sufficient numbers to allow each student the opportunity to obtain ample practice and gain necessary experience.

The course includes classes in the detailed procedure of Air Transport Command routes. Call

(Continued on page 82)



# A.C. Calculations for Parallel and Series-Parallel Circuits

*Solving for Current and Voltage by Means of Admittances*

BY S. E. SPITTLE,\* WAHSG

THE problem of finding the resultant impedance of a group of impedances in parallel is not usually discussed in the more elementary texts on alternating currents, probably because the solution of such problems is rather lengthy and difficult without the use of complex algebra. The term "complex algebra" may have a mysterious and rather terrifying sound to those who have never heard of it, but actually the process is comparatively simple for anyone having a knowledge of the elements of plain algebra.

The recent *QST* article entitled "Meet Mr.  $j$ "<sup>1</sup> provides a good explanation of the application of complex algebra to alternating-current circuits and should be read as an introduction to this discussion. In that article one method of computing the impedance of parallel circuits by means of their phase angles was described. An alternative method, described here, makes use of the resistive and reactive components without requiring a knowledge of the phase angles as such, and therefore can be applied without the use of trigonometric tables.

Since the laws of alternating-current circuits are merely extensions of the laws governing direct-current circuits, taking into account the effects produced by the storage of energy in the electric and magnetic fields, it is logical to explain the solution of a.c. problems in terms of the familiar operations used with d.c. problems. For example, take a circuit consisting of two resistances,  $R_1$  and  $R_2$  in parallel, as shown in Fig. 1.

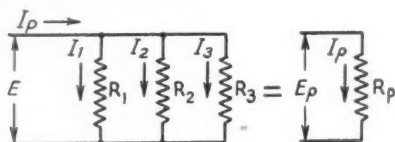


Fig. 1 — Parallel resistances.

$$\begin{aligned} I_1 &= EG_1 & I_3 &= EG_3 \\ I_2 &= EG_2 & I_p &= EG_p \end{aligned}$$

The usual formula for finding the parallel resistance of this combination is

$$R_p = \frac{R_1 R_2}{R_1 + R_2}$$

However, this formula is only a special case of the more general formula

$$1/R_p = 1/R_1 + 1/R_2 + 1/R_3 \dots \text{etc.},$$

\* 12 Griggs St., Allston 34, Mass.

<sup>1</sup> Noll, "Meet Mister  $j$ ," *QST*, October, 1943, p. 21

applied to the case of only two resistances. In the special case of two resistances, the second formula is converted into the first by means of a few simple transpositions. When there are more than two resistances, the general formula is more practical, as will readily be seen if we apply the same process to the case of three resistances. Thus

$$1/R_p = 1/R_1 + 1/R_2 + 1/R_3$$

when transposed becomes

$$R_p = \frac{R_1 R_2 R_3}{R_1 R_2 + R_2 R_3 + R_1 R_3}$$

It may be interesting to note that the process of finding the resulting resistance is the same as finding the total current in the parallel circuit, using any assumed value of applied e.m.f. Thus

$$I_p = E/R_p = E/R_1 + E/R_2 + E/R_3.$$

Changing the value of  $E$  will change  $I_p$  but not  $R_p$ . Therefore we can assume  $E$  to be one volt, giving the formula for the parallel resistance, which is usually expressed as

$$R_p = \frac{1}{1/R_1 + 1/R_2 + 1/R_3}$$

The same formula can be applied to a number of parallel impedances in an a.c. circuit, giving

$$Z_p = \frac{1}{1/Z_1 + 1/Z_2 + 1/Z_3}$$

The catch in this is that the currents in the various impedances are usually not in phase with each other, so that the phase difference must be taken into account in obtaining the correct value of parallel impedance. In the d.c. case the quantity  $1/R$  is known as the *conductance*, represented by  $G$  whose unit of measurement is the *mho*. Thus, a resistance of 5 ohms corresponds to a conductance of  $1/5$  or 0.2 mho. The total conductance of a parallel circuit is the sum of the conductances of the individual branches. Thus, making  $1/R_1 = G_1$ , etc., we have for three resistances in parallel

$$G_p = G_1 + G_2 + G_3,$$

and the equivalent or parallel resistance,  $R_p$ , is equal to  $1/G_p$ . The conductance,  $G$ , is numerically equal to the current which would flow with one volt applied to the circuit. Hence, in finding the total conductance of a parallel circuit by adding the individual conductances we are merely fol-

lowing the same process as in finding the total current by adding the individual currents. If this can be done for d.c. circuits we should likewise be able to do the same thing for a.c. circuits. In the latter case,  $1/Z$  is called the *admittance* and is represented by  $Y$ . Also, the total admittance of a parallel circuit is

$$Y_p = Y_1 + Y_2 \dots \text{etc.}$$

The value of  $Y$  is also measured in mhos, just as resistance, reactance and impedance all are measured in ohms.

Here we remember our forgotten friend, the phase angle. We know that if we apply an alternating voltage to a circuit having several parallel branches, the absolute values of the branch currents will add up to more than the absolute value of total current unless all the currents happen to be in phase. Since the admittance is a measure of the value of current that would flow in an impedance when one volt is applied, it is necessary to add admittances in the same manner as we add currents in a parallel circuit. The only practical ways of adding a number of currents, voltages or impedances having various phase angles are by drawing scale diagrams or by splitting each one into two components at right angles to each other, adding the two sets of components separately and then combining the two sums by the familiar right-triangle rule, or Pythagorean theorem. One component represents the condition of current in phase with voltage, or 100 per cent energy consumption, and is often called the *real* component. The other component represents the condition of current and voltage 90 degrees out of phase, or 100 per cent energy storage, and is often called the *imaginary* component. This component is usually prefixed by the letter  $j$  to show that it has been rotated 90 degrees with respect to the real component. The letter  $j$  has been given the value of  $\sqrt{-1}$ , and when it occurs in a computation it is treated as a multiplier having this value, as has already been explained in the article mentioned previously. Algebraic numbers having  $\sqrt{-1}$  as a factor are known as imaginary numbers, which explains the name given the components of voltage, etc., to which the letter  $j$  is applied. The method of adding the real and imaginary components of voltage or current also is covered very well by Mr. Noll and therefore only its application to parallel circuits will be discussed here.

The preceding paragraph implies that we must split up each of our admittances into two components before we can add them. To obtain the components of the admittance we make use of the complex expression for impedance, which means the impedance when split into its components of resistance and reactance. Expressed thusly,

$$Z = R + jX,$$

the  $j$  means that, if a diagram of the components of impedance is drawn, the reactance,  $X$ , will be drawn at right angles to the resistance,  $R$ . Then,

In many problems of parallel impedance the mathematical solutions can be simplified by the use of admittances. In this way frequent reference to trigonometric tables is unnecessary, since phase angles no longer are factors in the computations. Practical application of the method is discussed in this article and illustrated with typical examples.

since  $Y = 1/Z$ , the corresponding admittance would be

$$Y = \frac{1}{R + jX}$$

In order to get the complex expression out of the denominator we multiply the fraction by

$$\frac{R - jX}{R - jX},$$

giving

$$\left( \frac{1}{R + jX} \right) (R - jX) = \frac{R - jX}{R^2 + X^2},$$

since  $j^2 = -1$ . Now we have

$$Y = \frac{R - jX}{R^2 + X^2},$$

or

$$Y = \frac{R}{R^2 + X^2} - \frac{jX}{R^2 + X^2}$$

However, we know that

$$R^2 + X^2 = Z^2.$$

Therefore the two parts of the admittance,  $Y$ , are  $R/Z^2$  and  $-jX/Z^2$ . If  $Z$  happened to be a pure resistance,  $X$  would equal zero, and  $R/Z^2$  would become equal to  $R/R^2$  or  $1/R$ , which is called  $G$ , or conductance in d.c. circuits. The term  $R/Z^2$  is therefore called the a.c. conductance and is also represented by the letter  $G$ . The term  $X/Z^2$ , which is the reactive or imaginary part of the admittance, is known as the *susceptance* and is represented by  $B$ . Thus,

$$Y = G - jB,$$

where  $G = R/Z^2$  and  $B = X/Z^2$ . Note that the

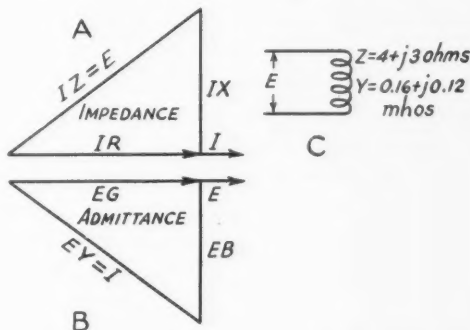


Fig. 2 — Impedance (A) and admittance (B) diagrams for the coil (C). In the impedance diagram, the current,  $I$ , is used as the reference, while the voltage,  $E$ , is used as reference in the diagram of (B).

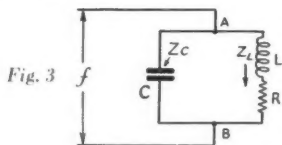
phase angle of the admittance is of sign opposite to that of the corresponding impedance.<sup>2</sup>

Fig. 2 shows an impedance diagram at A and the corresponding admittance diagram at B for a coil having 4 ohms resistance and 3 ohms reactance (C). The diagrams are shown in terms of the components of voltage and current, and an applied e.m.f. of 25 volts is assumed, so that both diagrams will be to the same scale.

To find the resultant impedance of a number of impedances in parallel, we add the admittances of the individual branches to obtain the total admittance. The impedance of the combination is then the reciprocal of the total admittance, or

$$Z = 1/Y_c.$$

The application of this method will be shown by a couple of examples.



For the first example we shall take the tuned circuit of Fig. 3, consisting of a condenser of 400- $\mu$ fd. capacity with negligible resistance, and a 100-microhenry inductance coil having a resistance of 20 ohms. A circuit with these values will be series resonant at 795.58 kilocycles, as can be verified by the formula for resonance,

$$f = \frac{1}{2\pi\sqrt{LC}}.$$

We shall now calculate the impedance of the circuit at this frequency, assuming a voltage to be applied between the points A and B, making it a parallel-resonant circuit. Since the factor  $\omega = 2\pi f$  is used in calculating both inductive and capacitive reactances, we start by computing its value as follows:

$$\omega = (2)(3.1416)(795,580) = 5,000,000 \text{ (electrical radians)}.$$

The impedance of the capacity branch is

$$R_c = jX_c.$$

$$R_c = 0 \text{ and}$$

$$X_c = 1/\omega C = \frac{1,000,000,000,000}{(5,000,000)(400)} = 500 \text{ ohms.}$$

(There are 1,000,000,000,000 micromicrofarads in one farad). Therefore  $Z = 0 - j500$  ohms. The admittance of this branch is

$$Y_c = G_c - jB_c$$

$$G_c = R_c/Z_c^2 = 0$$

$$B_c = X_c/Z_c^2 = \frac{-j500}{500^2} = -j0.002 \text{ mho.}$$

Therefore,

$$Y_c = 0 - (-j0.002) = 0 + j0.002 \text{ mhos.}$$

Since the impedance in this particular case is a

<sup>2</sup>  $B$  is sometimes defined as  $-X/Z^2$ , making  $Y = G + jB$ . This of course, is equivalent to the relation given above.

pure reactance we could have found  $B$  directly, since  $1/X_c = \omega C$ . This short cut cannot be used, however, if the impedance also has a resistive component.

The impedance of the inductive branch is

$$Z_L = R_L + jX_L$$

$$R_L = 20 \text{ ohms and}$$

$$X_L = \omega L = (5,000,000)(0.0001) \text{ henries} = 500 \text{ ohms,}$$

so

$$Z_L = 20 + j500 \text{ ohms.}$$

The admittance

$$Y_L = G_L - jB_L$$

$$G_L = \frac{20}{20^2 + 500^2}$$

$$B_L = \frac{500}{20^2 + 500^2}$$

and

$$Y_L = \frac{20 - j500}{20^2 + 500^2} = 0.00008 - j0.001997 \text{ mho.}$$

The admittance of the parallel circuit is

$$Y_{ab} = Y_c + Y_L$$

$$= (0 + j0.002) + (0.00008 - j0.001997),$$

which is added thusly,

$$0 + 0.00008 + j0.0002 - j0.001997$$

$$= 0.00008 + j0.000003 \text{ mho.}$$

The impedance then is

$$Z_{ab} = 1/Y_{ab} = \frac{1}{0.00008 + j0.000003}$$

$$= \frac{0.00008 - j0.000003}{(0.00008)^2 + (0.000003)^2}$$

$$= 12,500 - j469 \text{ ohms.}$$

The result shows that the inductive and capacitive reactances in a parallel circuit do not cancel out in the same manner as they do in a series circuit. This results from the fact that the resistance in the inductive branch shifts the phase of the

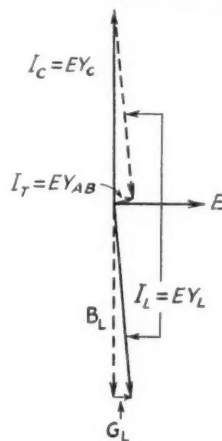


Fig. 4 — Vector diagram of the currents in the various branches of the circuit of Fig. 3.

current slightly, so that it is not exactly 180 degrees out of phase with the current in the capacity branch. The current for a given applied voltage is equal to  $E/Z$  or  $EY$ , since  $Y = 1/Z$ . Therefore a diagram of the relative values and phases of currents in various parts of the circuit can be drawn by using the values of  $Y$  to represent the currents, since current is proportional to  $Y$ . Fig. 4 is such a diagram, with the conductance and total current exaggerated to show the effect of resistance in the circuit. Actually the frequency at which the resultant reactance is zero is so close to the frequency at which  $X_L = X_C$  that for all practical purposes they can be considered identical except in circuits having lower values of  $Q$  than are ordinarily used in radio work. Such low- $Q$  circuits are, however, found in television amplifiers and are also likely to be found in audio-frequency work.

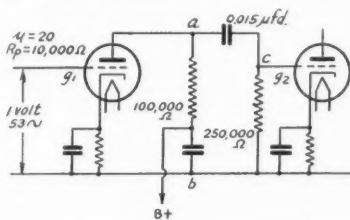


Fig. 5 — Resistance-coupled amplifier circuit.

A second example, illustrating a series-parallel circuit, is the resistance-coupled amplifier shown in Fig. 5. An exact calculation for such an amplifier, taking into account all possible current paths, is quite complicated, so that it is customary to reduce the amplifier to a simplified circuit which approximately represents the conditions existing for the frequency of interest. For low frequencies the circuit of Fig. 5 can be represented by Fig. 6, where the applied voltage is the a.c. voltage developed between plate and cathode by a signal, and is equal to  $\mu$  times the a.c. voltage applied between grid and cathode.

The voltage  $e_{g2}$  between grid and cathode of the following tube is practically equal to the voltage drop across the grid leak, since the voltage across the cathode by-pass condenser is negligible if the by-pass condenser has a fairly large capacity (considering the drop caused by the applied grid voltage only). This voltage will, therefore, be a portion of the voltage between A and B and will then depend upon the frequency as well as the constants of the circuit. Assuming the frequency of the applied signal to be 53 cycles per second, the reactance of the coupling condenser will be 200,000 ohms. With an applied signal of 1 volt and an amplification factor of 20 the amplified a.c. voltage applied to the network of Fig. 6 will be 20 volts. This voltage will be divided between the internal resistance of the tube,  $R_p$ , and the impedance,  $Z_{ab}$ , between points A and B.

The admittance  $Y_{ab}$  will be the sum of the admittances of the two branches, one being the

plate-coupling resistance,  $R_1$ , and the other consisting of the grid leak,  $R_2$ , in series with the coupling condenser. For the first branch

$$Z_1 = R_1 = 100,000 + j0 \text{ ohms and} \\ Y_1 = 0.00001 - j0 \text{ mho.}$$

For the second branch

$$Z_2 = R_2 - jX_2 = 250,000 - j200,000 \text{ ohms and}$$

$$Y_2 = \frac{250,000}{Z_2^2} - \frac{j(-200,000)}{Z_2^2} \\ + \frac{250,000 + j200,000}{250,000^2 + 200,000^2}$$

The calculations for a high impedance such as this can be performed more conveniently by expressing the impedance in megohms. The corresponding admittance will then be in micromhos. Thus,

$$Y_2 = \frac{0.25 + j0.2}{0.25^2 + 0.2^2} = 2.44 + j1.95 \text{ micromhos,} \\ \text{and } Y_1 = 10 - j0 \text{ micromhos.}$$

Then

$$Y_{ab} = Y_1 + Y_2 = 10 + j0 + 2.44 + j1.95 \\ + 12.44 + j1.95 \text{ micromhos.}$$

The impedance between points A and B will be

$$Z_{ab} = 1/Y_{ab} = \frac{1}{12.44 + j1.95} \\ = \frac{12.44 - j1.95}{12.44^2 + 1.95^2} = 0.0784 - j0.0123 \text{ megohms.}$$

In order to find the voltage  $e_{g2}$  we must first find the voltage between the points A and B. The impedance  $Z_{ab}$  in series with the plate resistance  $R_p$  forms a voltage divider. Therefore, the voltage across  $Z_{ab}$  will be equal to

$$\left( \frac{20}{R_p + Z_{ab}} \right) \text{ volts.}$$

$R_p$  is 10,000 ohms resistance or  $0.01 + j0$  megohms. Therefore,

$$Z_{ab} + R_p = 0.0884 - j0.0123 \text{ megohms.}$$

$$\frac{Z_{ab}}{Z_{ab} + R_p} = \frac{0.0784 - j0.0123}{0.0884 - j0.0123} \\ = \frac{(0.0784 - j0.0123)(0.0884 + j0.0123)}{0.0884^2 + 0.0123^2} \\ = \frac{0.00708 - j0.000123}{0.00808} = 0.876 - j0.0165.$$

$e_{ab} = (20)(0.876 - j0.0165) = 17.52 - j0.33 \text{ volts.}$   
The voltage  $e_{ab}$  is the sum of  $e_{g2}$  and the volt-

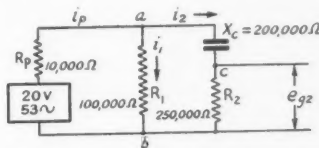


Fig. 6 — Equivalent circuit of the resistance-coupled amplifier in Fig. 5 for low frequencies.

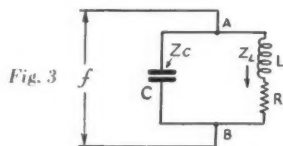
phase angle of the admittance is of sign opposite to that of the corresponding impedance.<sup>2</sup>

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$$Y_c = 0 - (-j0.002) = 0 + j0.002 \text{ mhos.}$$

Since the impedance in this particular case is a

<sup>2</sup>  $B$  is sometimes defined as  $-X/Z^2$ , making  $Y = G + jB$ . This of course, is equivalent to the relation given above.

pure reactance we could have found  $B$  directly, since  $1/X_c = \omega C$ . This short cut cannot be used, however, if the impedance also has a resistive component.

The impedance of the inductive branch is

$$Z_L = R_L + jX_L$$

$$R_L = 20 \text{ ohms and}$$

$$X_L = \omega L = (5,000,000) (0.0001) \text{ henries} \\ = 500 \text{ ohms,}$$

so

$$Z_L = 20 + j500 \text{ ohms.}$$

The admittance

$$Y_L = G_L - jB_L$$

$$G_L = \frac{20}{20^2 + 500^2}$$

$$B_L = \frac{500}{20^2 + 500^2}$$

and

$$Y_L = \frac{20 - j500}{20^2 + 500^2} = 0.00008 - j0.001997 \text{ mho.}$$

The admittance of the parallel circuit is

$$Y_{ab} = Y_c + Y_L$$

$$= (0 + j0.002) + (0.00008 - j0.001997),$$

which is added thusly,

$$0 + 0.00008 + j0.0002 - j0.001997 \\ = 0.00008 + j0.000003 \text{ mho.}$$

The impedance then is

$$Z_{ab} = 1/Y_{ab} = \frac{1}{0.00008 + j0.000003} \\ = \frac{0.00008 - j0.000003}{(0.00008)^2 + (0.000003)^2} \\ = 12,500 - j469 \text{ ohms.}$$

The result shows that the inductive and capacitive reactances in a parallel circuit do not cancel out in the same manner as they do in a series circuit. This results from the fact that the resistance in the inductive branch shifts the phase of the

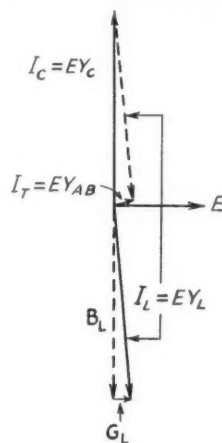


Fig. 4 — Vector diagram of the currents in the various branches of the circuit of Fig. 3.

current slightly, so that it is not exactly 180 degrees out of phase with the current in the capacity branch. The current for a given applied voltage is equal to  $E/Z$  or  $EY$ , since  $Y = 1/Z$ . Therefore a diagram of the relative values and phases of currents in various parts of the circuit can be drawn by using the values of  $Y$  to represent the currents, since current is proportional to  $Y$ . Fig. 4 is such a diagram, with the conductance and total current exaggerated to show the effect of resistance in the circuit. Actually the frequency at which the resultant reactance is zero is so close to the frequency at which  $X_L = X_C$  that for all practical purposes they can be considered identical except in circuits having lower values of  $Q$  than are ordinarily used in radio work. Such low- $Q$  circuits are, however, found in television amplifiers and are also likely to be found in audio-frequency work.

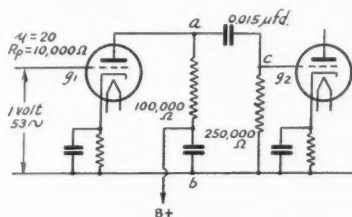


Fig. 5 — Resistance-coupled amplifier circuit.

A second example, illustrating a series-parallel circuit, is the resistance-coupled amplifier shown in Fig. 5. An exact calculation for such an amplifier, taking into account all possible current paths, is quite complicated, so that it is customary to reduce the amplifier to a simplified circuit which approximately represents the conditions existing for the frequency of interest. For low frequencies the circuit of Fig. 5 can be represented by Fig. 6, where the applied voltage is the a.c. voltage developed between plate and cathode by a signal, and is equal to  $\mu$  times the a.c. voltage applied between grid and cathode.

The voltage  $e_{g2}$  between grid and cathode of the following tube is practically equal to the voltage drop across the grid leak, since the voltage across the cathode by-pass condenser is negligible if the by-pass condenser has a fairly large capacity (considering the drop caused by the applied grid voltage only). This voltage will, therefore, be a portion of the voltage between A and B and will then depend upon the frequency as well as the constants of the circuit. Assuming the frequency of the applied signal to be 53 cycles per second, the reactance of the coupling condenser will be 200,000 ohms. With an applied signal of 1 volt and an amplification factor of 20 the amplified a.c. voltage applied to the network of Fig. 6 will be 20 volts. This voltage will be divided between the internal resistance of the tube,  $R_p$ , and the impedance,  $Z_{ab}$ , between points A and B.

The admittance  $Y_{ab}$ , will be the sum of the admittances of the two branches, one being the

plate-coupling resistance,  $R_1$ , and the other consisting of the grid leak,  $R_2$ , in series with the coupling condenser. For the first branch

$$Z_1 = R_1 = 100,000 + j0 \text{ ohms and} \\ Y_1 = 0.00001 - j0 \text{ mho.}$$

For the second branch

$$Z_2 = R_2 - jX_2 = 250,000 - j200,000 \text{ ohms and}$$

$$Y_2 = \frac{250,000}{Z_2^2} - \frac{j(-200,000)}{Z_2^2} \\ + \frac{250,000 + j200,000}{250,000^2 + 200,000^2}$$

The calculations for a high impedance such as this can be performed more conveniently by expressing the impedance in megohms. The corresponding admittance will then be in micromhos. Thus,

$$Y_2 = \frac{0.25 + j0.2}{0.25^2 + 0.2^2} = 2.44 + j1.95 \text{ micromhos,} \\ \text{and } Y_1 = 10 - j0 \text{ micromhos.}$$

Then

$$Y_{ab} = Y_1 + Y_2 = 10 + j0 + 2.44 + j1.95 \\ + 12.44 + j1.95 \text{ micromhos.}$$

The impedance between points A and B will be

$$Z_{ab} = 1/Y_{ab} = \frac{1}{12.44 + j1.95} \\ = \frac{12.44 - j1.95}{12.44^2 + 1.95^2} = 0.0784 - j0.0123 \text{ megohms.}$$

In order to find the voltage  $e_{g2}$  we must first find the voltage between the points A and B. The impedance  $Z_{ab}$  in series with the plate resistance  $R_p$  forms a voltage divider. Therefore, the voltage across  $Z_{ab}$  will be equal to

$$\left( \frac{20}{R_p + Z_{ab}} \right) \text{ volts.}$$

$R_p$  is 10,000 ohms resistance or  $0.01 + j0$  megohms. Therefore,

$$Z_{ab} + R_p = 0.0884 - j0.0123 \text{ megohms.}$$

$$\frac{Z_{ab}}{Z_{ab} + R_p} = \frac{0.0784 - j0.0123}{0.0884 - j0.0123} \\ = \frac{(0.0784 - j0.0123)(0.0884 + j0.0123)}{0.0884^2 + 0.0123^2} \\ = \frac{0.00708 - j0.000123}{0.00808} = 0.876 - j0.0165.$$

$e_{ab} = (20)(0.876 - j0.0165) = 17.52 - j0.33$  volts. The voltage  $e_{ab}$  is the sum of  $e_{g2}$  and the volt-

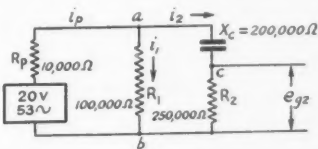


Fig. 6 — Equivalent circuit of the resistance-coupled amplifier in Fig. 5 for low frequencies.

age drop across the coupling condenser since they are in series. Therefore,

$$e_{g2} = \left( e_{ab} \right) \left( \frac{R_g}{Z_2} \right).$$

$$\begin{aligned} \frac{R_g}{Z_2} &= \frac{0.25 + j0}{0.25 - j0.2} = 0.25 \left( \frac{0.25 + j0.2}{0.25^2 + 0.2^2} \right) \\ &= \frac{0.0625 + j0.5}{0.1025} = 0.609 + j0.487. \end{aligned}$$

$$\begin{aligned} e_{g2} &= \left( e_{ab} \right) \left( \frac{R_g}{Z_2} \right) = (17.5 - j0.33)(0.609 + j0.487) \\ &= 10.8 + j8.32 \text{ volts.} \end{aligned}$$

The absolute value of this voltage is

$$\sqrt{10.8^2 + 8.32^2} = 13.6 \text{ volts.}$$

The overall amplification or ratio of voltage at grid No. 2 to that at grid No. 1 will then be 13.6, since one volt was assumed to be applied to grid No. 1. The voltage at grid No. 2 will lead the voltage at plate No. 1 by an angle whose tangent is

$$\frac{8.32}{10.8} = 0.77, \text{ or } 37.6 \text{ degrees (See Fig. 7).}$$

It is not necessary to find any phase angles to determine the voltage or current anywhere in the circuit. In fact, the relative phase of any voltage in the circuit can be found by graphical methods with sufficient accuracy for ordinary purposes. The fact that the voltages are expressed as complex quantities makes it easy to draw a scale diagram of the various voltages in the circuit. Such a diagram is useful for checking the accuracy of the calculations. A diagram of the voltages in this circuit is shown in Fig. 7, and a diagram of the relative currents is shown in Fig. 8. The values of alternating current in microamperes can be found by multiplying the admittance in micromhos by the applied e.m.f. of 20 volts ( $I = EY$ ). The voltages and currents considered in this problem are, of course, only the alternating parts of the pulsating voltages and currents in the actual amplifier. The d.c. values

have no other effect than to establish the values of  $R_p$  and  $\mu$  and to determine the amplitude of voltage that can be applied before distortion begins.

In practical work the performance of amplifiers is ordinarily computed by means of graphs or approximate formulas rather than such detailed calculations. The examples given above were used instead of the usual problems concerning miscellaneous collections of inductance and capacity because they are typical of the circuits actually found in radio equipment, and thus should indicate that the methods of calculations illustrated have practical applications.

One desirable feature of using complex notation is that it eliminates the necessity for extracting square roots except for one such operation as the last step in the calculations, when the absolute value of current or voltage is desired, as is usually the case. A vector diagram of all the values in the problem should be drawn as a check on the calculations and to make sure that plus signs have not been slipped in where there should be minus signs or vice versa. Such errors are usually readily apparent as soon as construction of the diagram is attempted. The vector diagram need only be drawn roughly to scale, and may be in terms of voltages, currents, impedances or admittances, whichever is most convenient.

## Underwriters' Laboratories 50 Years Old

**DURING** the past fifty years 375,000 different products, in recent years many of them in the field of radio, have been made safer and more reliable by virtue of having passed the tests and safety specifications of Underwriters' Laboratories, Inc. Founded in Chicago in 1894 to aid in investigating the fire hazard of lighting equipment and the performance of safety devices, Underwriters' Laboratories has grown from a one-room laboratory to an establishment whose facilities include testing stations in New York and San Francisco, in addition to the main station in Chicago with its seventeen specialized departmental laboratories handling a great variety of work.

The electrical department laboratory in the early days contained \$350 worth of equipment, much of it hand-made. Now it is provided with extensive and special test apparatus and, besides testing electrical equipment investigates radio receivers, transmitters, converters, amplifiers, recording devices and their component parts, filter units, antenna-ground connection receptacles, lightning arresters, and other similar items. In addition to subjecting devices and materials to intensive tests under normal and extreme conditions of service at the Laboratory, comprehensive factory inspections, including examination of the raw materials used in the articles, are made so long as an article remains on the list of tested and approved products.

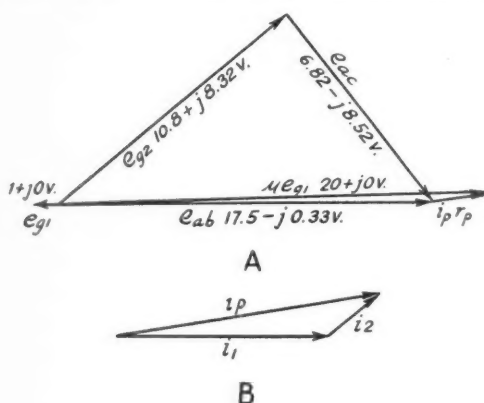


Fig. 7 — Vector diagrams useful in checking calculations. (A) shows the relative values of voltage in the circuit of Fig. 6, while (B) shows relative currents.

# HAPPENINGS OF THE MONTH



## SHIP OPERATORS WANTED

THE War Shipping Administration has sent out an urgent call for five hundred ship operators by next July, and many more thereafter, to meet requirements for three civilian operators on certain vessels formerly carrying but one operator. This is a real opportunity for presently licensed first- and second-class radiotelegraph operators wanting sea duty, as well as for many amateurs willing to study for a temporary limited radiotelegraph second-class operator license.

In spite of its extended title, this class of commercial license is the easiest of all to get. A code test of sixteen code groups a minute and a 50 per cent passing mark on the regular FCC second-class radiotelegraph operator examination are required or, for those who have previously held a first- or second-class radiotelegraph license which has now lapsed, the code test without written examination is necessary.

Base pay starts at \$180 per month, plus bonus, living quarters and food. Operators are ship's officers, wear uniforms with appropriate insignia and have their own quarters. Considering present living costs, these positions are superior to shore jobs paying \$300 a month. Draft deferment is given radio operators in the merchant marine, since they are in work essential to the war effort requiring a high degree of skill and training.

If you can meet the license requirements this is a real chance to apply your talents in one of the best possible ways to meet a war emergency — and get well paid for it in the bargain. Applicants should call at any Recruitment & Manning Organization office, U. S. Employment Service office, or wire collect to Recruitment & Manning Organization, War Shipping Administration, Washington 25, D. C.

## PHYSICISTS & ENGINEERS

THIS magazine is advised that a considerable need continues to exist for high-caliber engineers and physicists capable of playing a prominent part in research and development work concerned with new technical devices in the war. The need is particularly keen for top-flight men capable of assuming the direction of projects. This work is in no sense tapering off just because we are well into the war. Because it is felt that there may be many men still interested in an opportunity to employ their talents more effectively in the war, a channel has been opened for confidential correspondence with a view to mutual examination of the possibilities. Experienced men and women in this position are invited to correspond with the president of the League, George W. Bailey, Chief of Scientific Personnel, Office of Scientific Research & Development, 1530 P Street, N. W., Washington 25, D. C.

## BOARD MEETING HIGHLIGHTS

PLANS for the release and rehabilitation of amateur radio of course occupied the major attention of the Board of Directors of ARRL when it held its annual meeting in an all-day session at Hartford on May 5th. Every division was represented but the Atlantic, whose acting director unfortunately was ordered to a few days' duty outside the country on the very eve of the meeting.

At the opening of the meeting all the directors and League officials stood with bowed heads in silent tribute to the late Dr. Eugene Woodruff, W8CMP, our former president. As business began, an effort was made to clear the decks quickly for the principal subject of the meeting, and the many matters of reports, filings, ratifications and appropriations were rapidly got out of the way.

Then the Board heard from its Planning Committee, charged under the chairmanship of Vice-President Blalack with the duty of preparing plans to insure our restoration to the air. The other officers of the League also made supplemental oral reports in this connection. The data thus assembled, the Board for the next several hours constituted itself a Committee of the Whole to digest and discuss the situation, a procedure making for freer discussion and less formality. Finding out in this manner what it thought and what it wanted to do, it resumed session as a Board, heard a report from itself on what was recommended, and proceeded to certain actions:

The Board found the amateur situation well in hand, the present outlook good, no conditions calling for emergency action at this time. Nonetheless, to be on the safe side, and to permit close watching of Washington developments and participation in them, it decided that the League will establish a temporary Washington office when the time is ripe; and, in view of the availability of the president for such purposes, it amended the Constitution to permit paying temporary compensation to the president at such time and for such duration as it shall later decide. It reaffirmed its action early in the war of granting the president extraordinary powers to act in protecting amateur operation and renewed its authorization of \$10,000 available to him for the defense of amateur frequencies. It restated League policy as requiring the return of all previously assigned amateur bands with no net loss of channels, plus the acquisition of u.h.f. bands in harmonic relationship to 224-230 Mc. to as high in the spectrum as allocation is carried. The Board's planning committee itself was continued, was strengthened to five members, and its appropriation replenished.

The Board found the financial affairs of our League in flourishing condition. Increases in salary were given the treasurer and secretary. Secretary Warner having just rounded out 25 years of service to the League, the Board spread on its minutes resolutions expressing appreciation of his devotion to the interests of amateur radio.

This was election year for president and vice-president but there are no changes: the Board unanimously reelected Messrs. Bailey and Blalack to their respective offices.

There has just been time to write this brief account of the meeting before we go to press. The minutes themselves will appear in our next issue and will deserve your careful reading.

### IR.A.C. ELECTIONS

COMDR. PAUL D. MILES, USNR, head of the Frequency Section of the Office of Naval Communications, was elected chairman of the government's Interdepartment Radio Advisory Committee in early April, in pursuit of the customary policy of that body of rotating its chairmanship. He succeeds FCC Commissioner T. A. M. Craven, who, however, remains on the committee as FCC representative. Capt. E. M. Webster, chief of communications of the U. S. Coast Guard, was named vice-chairman and will automatically become chairman next year. Philip F. Siling, FCC assistant chief engineer for broadcasting, was elected chairman of the IRAC technical subcommittee and continues as IRAC's secretary.

Comdr. Miles has specialized on allocation matters in his radio careers both in and out of the Navy. Although an Academy graduate, he was in civilian radio life for a decade beginning in 1929, chiefly with Mackay, although retaining a reserve commission. He returned to the Navy in 1939 as a civilian engineer and in 1941 was ordered to active duty. He has been the vice-chairman of IRAC for the past year and is also the Navy observer on RTPB.



Ham radio was Cupid for W9WWP and W8VKJ.

### THIS KEATING GAL

WE NO SOONER present Carol A. Keating, W9WWP, to you as our new Acting Communications Manager than we have to change the name to Carol K. Witte — because she did. The groom is Lt.(jg) F. Richard Witte, USCG, W8VKJ. Although both are of Chicago, and were married there on April 8th, Lt. Witte is now back on duty in the Pacific and Mrs. Witte carries on at West Hartford. Yes, it was a radio romance, which started at the sessions of a high-school radio club. W8VKJ (a Michigan summer call) is ex-W9UPG, and is a son of W9PDJ, Chicago.

### YOUR WAR SERVICE RECORD

WE INTEND to keep right on publishing the now-familiar form that you find below and

## AMATEUR WAR SERVICE RECORD

Name

Present mailing address

Rank or rating

Branch or bureau: Signal Corps, AAF, Buships, WAVES, etc.  
If civilian industry, give title and company.

Call, present or ex; or grade of op-license only

### SERVICE

- ☐ Army
- ☐ Navy
- ☐ Coast Guard
- ☐ Marine Corps
- ☐ Maritime Service
- ☐ Merchant Marine
- ☐ Civil Service
- ☐ Radio industry, 100% war

pestering you every month until you have registered with ARRL headquarters the simple but essential facts of your wartime radio service. We are endeavoring to compile at headquarters a record of the service of radio amateurs in this war. If you are, or ever have been, a licensed amateur, of either the United States or Canada, holding either amateur station or amateur operator license, and are engaged in any aspect of communications work where radio know-how counts, we ask you to register with us — either by clipping the form below or by reproducing its essentials on a post card. We desire such a record whether your service is in uniform in the armed forces, or in the Civil Service, or in any other branch of government work of a nature essential to the war effort, or in those portions of the radio manufacturing industry which are 100 per cent devoted to the war effort. It will take you only a minute to fill out the form and it will be a big help to amateur radio. If you have a few additional minutes to spare, we would much appreciate similar data on your co-workers of amateur background. TU vvy.

#### ELECTION NOTICE

To All Full Members of the American Radio Relay League residing in the Midwest Division:

You are hereby notified that a special election is about to be held in your division to elect an alternate director for the unexpired remainder of the 1944-1945 term of the late Capt. William H. Graham, W9BNC. Your attention is invited to the applicable portions of the Constitution & By-Laws of the League, a copy of which will be mailed any member upon request.

The nomination of candidates is by petition. Nominating petitions are hereby solicited. Ten or more Full Members residing in the Midwest Division may join in nominating any eligible Full Member residing in that division as a candidate for this office. The following form is suggested:

##### Executive Committee

*The American Radio Relay League  
West Hartford, Conn.*

*We, the undersigned Full Members of the ARRL residing in the Midwest Division, hereby nominate ..... of ..... as a candidate for Alternate Director from this division for the unexpired remainder of the 1944-1945 term.*

*(Signatures and addresses)*

The signers must be Full Members in good standing. The nominee must be a Full Member and must have been both a member of the League and a licensed radio amateur operator for a continuous term of at least four years immediately preceding receipt by the Secretary of his petition of nomination, except that a lapse of not to exceed ninety days in the renewal of the operator's license and a lapse of not to exceed thirty days in the renewal of membership in the League, at any expiration of either during the four-year period, will not disqualify the candidate; provided that if a candidate's membership has been interrupted by reason of service in the armed forces of the United States, he shall not be deemed to be disqualified so far as concerns continuity of membership if he has, since May 7, 1943, renewed his ARRL membership within ninety days of discharge from the military service. He must be without commercial radio connections: he may not be commercially engaged in the manufacture, selling or renting of radio apparatus normally capable of being used in radio communication or experimentation, nor commercially engaged in the publication of radio literature intended for consumption by licensed radio amateurs. Further details concerning eligibility are given in By-Law 12. His complete name and address should be stated. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon EWT of the

20th day of July, 1944. No member shall append his signature to more than one such petition. To be valid, a petition must have the signatures of at least ten Full Members in good standing, in execution of a single document. A member holding a certificate of Associate Membership is not eligible to join in a nomination or to stand as a candidate.

If only one eligible candidate for this office is named, he will be declared elected without membership balloting. If more than one is named, voting will take place between July 20 and August 20, 1944, on ballots that will be mailed from the headquarters office to each Full Member of the Midwest Division. The balloting will be canvassed on August 20, 1944, and the new alternate director will take office immediately.

For the Board of Directors:

K. B. WARNER,  
Secretary

April 20, 1944.

#### CHANGES IN EXAM SKED

FCC ANNOUNCES that amateur examinations will now be given quarterly in Salt Lake City, instead of only twice a year: March, June, September and December. Information on the exact dates can be had from the Inspector-in-Charge at Denver.

Sioux Falls, S. D., has been named as an examining point instead of Huron, S. D., and will inherit its schedule of examinations in September and December. Exact dates can be had from the Inspector-in-Charge at St. Paul.

#### RADIO WORLD HONORS K. B. WARNER ON HIS TWENTY-FIFTH ANNIVERSARY

IT is no news to the radio world at large — and certainly not to the amateur fraternity in particular — that on April 26th Kenneth B. Warner celebrated his twenty-fifth anniversary as managing secretary of the ARRL. That the world is already aware of the fact is proved by the more than 400 testimonial letters received by KBW commemorating his anniversary — letters from The White House, from former President Hoover, from federal, state and local officials, from many a high-ranking Army and Navy officer, from ARRL directors, SCMs and affiliated clubs, and, of course, from hundreds of old-time ham friends and associates.

*(Continued on page 84)*



K. B. Warner, somewhat overwhelmed, examines the testimonial volume of congratulatory letters on his anniversary while fellow ARRL officers Lt. Col. F. E. Handy and D. H. Houghton look on approvingly.

# A Self-Contained Handie-Talkie

**A Compact Light-Weight WERS Unit Operating from Dry Batteries**

**BY CHARLES T. HAIST, JR.,\* W6TWL, EX-W9EQL**

**T**HE application of units of the handie-talkie type to WERS work is very practical in that they may be operated right at the scenes of incidents or disaster, leaving the operator free to walk or move around and still have one hand available to assist in other duties. Such low-power units are intended primarily to be used in conjunction with a higher-powered mobile unit which may be located several blocks away, parked in a favorable spot which permits satisfactory communication with the control center for the purpose of relaying messages.

When necessary, however, surprising distances can be covered with handie-talkie units when they are operated in the clear. Communications with control center KMFY-1, with a signal report of R4/S4 at distances up to ten miles, have been accomplished with the hand-portable shown in the photographs. R5/S5 reports have been logged at distances of up to three or four miles.

This unit is built along the lines of some of those used by the armed forces. The complete transceiver and its battery power supply, enclosed in an aluminum case as shown, weighs but  $3\frac{3}{4}$  pounds. The outside dimensions of the case are only  $2\frac{5}{8} \times 2\frac{3}{4} \times 11$  inches.

## Circuit Details

The transceiver circuit, shown in Fig. 1, is more or less conventional in most respects. It was drawn up around the type 1S4 tube, which is the secret of the set's compactness. Two tubes of this type are used in the unit. One, with its screen tied to the plate, is used as a triode oscillator and detector. The other 1S4 is used as an audio amplifier and modulator.

Many have encountered trouble in getting the 1S4 to superregenerate on frequencies as high as 112 Mc. In this circuit this difficulty was solved by placing a 0.005- $\mu$ fd. condenser,  $C_3$ , across the receiving grid leak,  $R_3$ .

\*750 Warfield Ave., Oakland 10, Calif.

The microphone is insulated from the aluminum case so that it may be connected in series with the single headphone,  $P$ , for side-tone transmitting. The headphone, which has an impedance of about 100 ohms, was provided with an output transformer,  $T_1$ , for proper impedance matching to the output of the 1S4. When transmitting, the secondary is opened and the primary is used as a Heising modulation choke.

Bias for the audio amplifier or modulator is provided by operating the "B" — below ground potential and using the voltage drop across  $R_1$ . Regeneration is controlled by a simple variable series resistance,  $R_4$ , in the "B" + lead to the detector so that an additional switch is not necessary to eliminate battery drain when the set is turned off.

The change-over switch,  $S_1$ , is a four-pole triple-throw rotary switch. In addition to the two usual positions, a third position, labeled  $O$  in Fig. 1, is provided where all battery circuits are open. The filament circuit is completed when the switch is placed in either the receiving or the transmitting position.

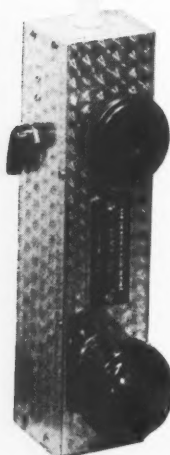
The filament battery consists of two No. 3 flashlight cells connected in parallel for longer life. They are held in the case by spring clips. The plate battery is a 67½-volt Minimax or two 45-volt hearing-aid batteries in series. These batteries are not too difficult to buy now, since stores are selling them on the open market after the nominal installation date has passed. One penlite cell provides adequate voltage for the microphone.

## Construction

The case for the unit is made of pieces of sheet aluminum fastened together with self-tapping screws. The metal was given a "swirl" finish by applying a spinning cork, held in the chuck of a drill press, after the aluminum sheet had been smeared with a thin coating of a mixture of valve-grinding compound and oil.

The microphone, mounted

These two views of W6TWL's hand-portable transceiver show the arrangement of controls. The left-side view shows the headphone, microphone, and, on the side, the change-over switch. The right-side view shows the regeneration control on the side and the tuning knob and scale on the rear.



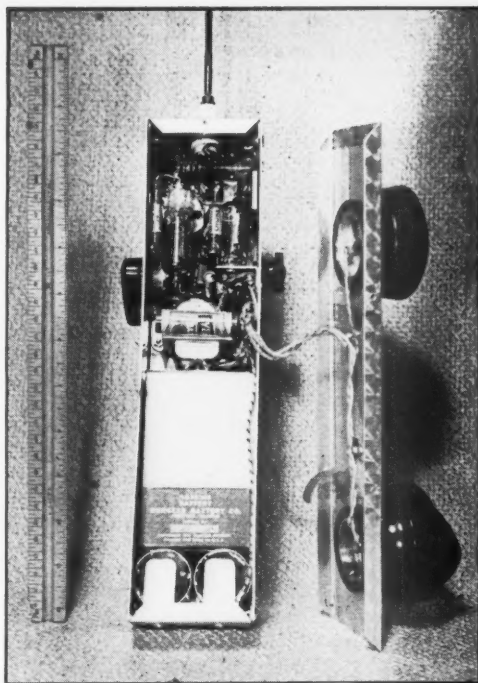
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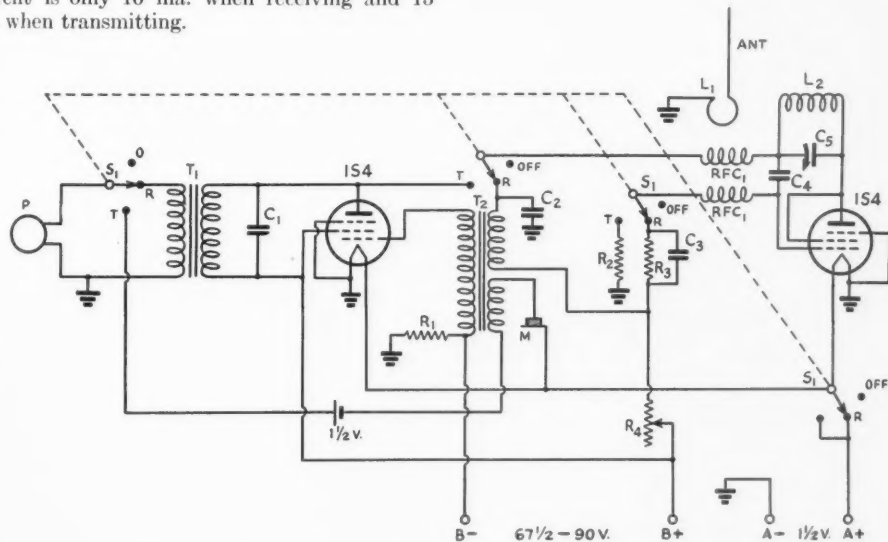
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|--|---|--|
| C <sub>1</sub> — 0.001- $\mu$ fd. midget mica. | R <sub>4</sub> — 100,000-ohm potentiometer (regeneration control).        | M — Single-button carbon microphone (see text).          |
| C <sub>2</sub> — 0.003- $\mu$ fd. midget mica. | L <sub>1</sub> — 1 turn No. 12, 1/2-inch inside diameter.                 | P — Single headphone, 100 ohms (see text).               |
| C <sub>3</sub> — 0.005- $\mu$ fd. midget mica. | L <sub>2</sub> — 4 turns No. 12, 1/2-inch inside diameter.                | S <sub>1</sub> — Four-pole three-position rotary switch. |
| C <sub>4</sub> — 50- $\mu$ fd. midget mica.    | RFC <sub>1</sub> — V.h.f. r.f. choke (Ohmite Z-0 or homemade equivalent). | T <sub>1</sub> — 8000- to 100-ohm output transformer.    |
| C <sub>5</sub> — 2-plate midget variable.      |   | T <sub>2</sub> — Transceiver transformer.                |
| R <sub>1</sub> — 750 ohms, 1/2-watt carbon.    |   |  |
| R <sub>2</sub> — 25,000 ohms, 1/2-watt carbon. |   |  |
| R <sub>3</sub> — 10 megohms, 1/2-watt carbon.  |   |  |



## 25 YEARS AGO THIS MONTH

This department has been absent from *QST* for twenty months because, during that period twenty-five years ago, in World War I, *QST* had suspended publication and ARRL was dormant. But now we come to the twenty-fifth anniversary of our reopening issue, that for June of 1919, and we resume this column.

THE June reopening issue is a small one of only 32 pages for, like the League itself and all of amateur radio, a new beginning must be made. Amateur radio has been closed for two years — not only transmitting but receiving, with apparatus sealed and antennas lowered. Now, on April 15th, the restriction on receiving has been removed and the Navy Department gives assurance that the ban on amateur transmitting will be lifted as soon as the President announces that a state of peace exists. A great electric wave has run through all amateur radio. Everybody is excited and eagerly at work, getting a receiving wire back in the air and planning for the resumption of transmitting. The Board of Direction immediately had a meeting in New York City and laid out large plans for the rebuilding of ARRL and the reopening of *QST*. Unfortunately the League is broke. A plan has been devised to borrow working capital from the membership, on Certificates of Indebtedness, or bonds, to be issued in denominations of \$1 to \$200, bearing interest at 5 per cent and to be taken up within two years. There isn't even money enough in the treasury to carry that story to the membership, so the hat is passed at the Board meeting and money enough raised to send out, in May, a midget issue of *QST* which announces the reopening plans and urges members to buy bonds to start the ball rolling.

Now it is June and the first postwar issue appears. The cover carries a message of greetings from President Maxim to all amateurs on this happy occasion. "It makes us appreciate what it is to be Americans — freemen of a great Democracy. . . . Our own record in the great struggle for liberty is something we can regard with pride. Our country had need of us amateurs in the early days of unpreparedness and the need was very great. It is for us to stand and say that almost every single one of us who was of military age and in good physical condition responded to the need. . . . To all interested in amateur wireless, whether they be members of our organization or not, we extend the hand of good fellowship. We believe that amateur wireless is to be one of the great institutions of the future. We hope that we may be . . . of some assistance in carrying it to its great destiny."

There has been some reorganization. Mr. Maxim of course is still president. The new office of traffic manager has been created and J. O. Smith,

2ZL, appointed thereto. R. H. G. Mathews, 9ZN, has been elected vice-president, and C. R. Runyon, jr., 2AG, is treasurer. Tuska, founder of *QST* and first secretary and co-founder of ARRL, has become a design engineer for the A. C. Gilbert Company in New Haven. K. B. Warner, 9JT, of Cairo, Illinois, is the new secretary-editor. The League constitution has been brought up to date. The Operating Department has been overhauled and is large with plans for the resumption of relay traffic. Under Traffic Manager Smith the League has six divisions, each under a Division Manager: Atlantic Division, Charles A. Service, jr.; East Gulf, J. C. Cooper, jr.; West Gulf, F. M. Corlett; Central, R. H. G. Mathews; Rocky Mountain, C. E. Hart; Pacific, L. L. Hoyt. Division Managers appoint assistant DMs and district superintendents, the latter being the contact points with the general membership. Local clubs are to be formed and affiliated with the League. The first activity reports arrive and show the enthusiasm with which everyone approaches reopening. The editor warns that the old hit-or-miss days are gone and that we must now learn to experiment scientifically, not in the manner that a blacksmith experiments.

There is a story by "The Old Man" in this issue: "Rotten Starting." Not only that but a package has been received from TOM. It contained a well-preserved and absolutely authoritative specimen of a Wouff Hong, and a photograph of it of course appears in the issue. The editor confesses to a distinct and uncanny chill when he regarded the thing, and in fact at the time he wrote he had not entirely recovered his customary poise and self-confidence. It was shown to the Board of Direction at a meeting on May 3rd, and each face noticeably blanched when the awful Wouff Hong was laid upon the table. It is to be hung in the headquarters office as a horrible example of what awaits amateurs who persist in causing unnecessary QRM.

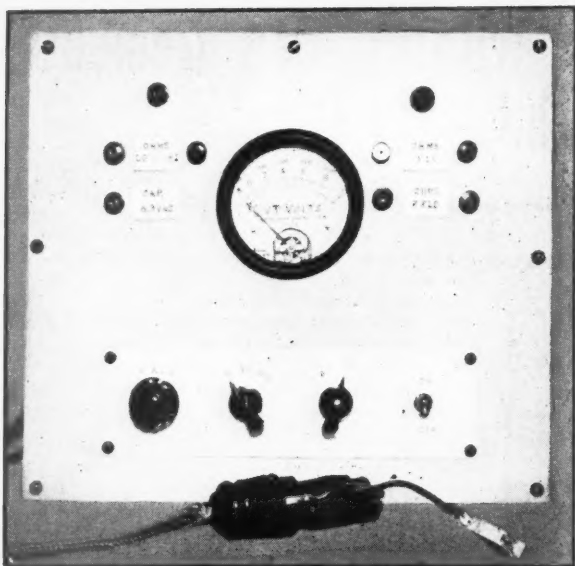
On the technical side, the composite Dr. Radio reports on "New Developments," largely about new vacuum tubes and circuits therefor, at least one of which latter is wrong. (And we did them ourself!) With the war's inventions coming out from under wraps, K. B. Warner tells the boys about "The Famous VT-1." So great have been the developments since the round deForest audions that the editor estimates that the ordinary amateur may expect to be able to read signals 1/25 of the strength that was barely audible when we stopped in 1917. The advertisers present their wares, and although much of the gear has a familiar prewar look, everyone is looking forward to celebrating opening night. It is going to be a grand occasion!

— K. B. W.

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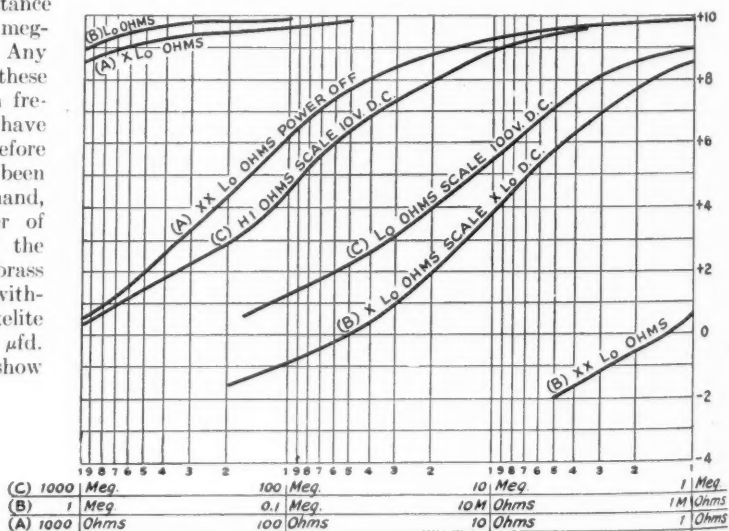


Front view of the v.t.v.m. described in the November issue of *QST*, as modified with pin jacks added on the panel for making connections for resistance and capacitance measurements.

with that shown in the November article. To use the meter for this purpose it was necessary to change the ground connection from the center-tap of the filament to one side, as shown in the circuit diagram. The voltage at the end of the tube prod was 5.7 volts r.m.s., which gave a reading of 8 volts peak on the meter scale. A separate calibration curve was made for capacity against voltage by taking readings on several condensers which were known to be close to marked capacity.

In testing a handful of new and junk-box condensers we noted some surprising readings. Out of about a dozen new mica postage-stamp condensers tested there was one which showed no capacity at all and another which read so high it was tested for d.c. resistance and found to have 10 megohms leakage resistance. Any attempt to use either of these condensers at very high frequencies would probably have led to a long headache before the trouble could have been found. On the other hand, one very old condenser of about 1925 vintage, of the type having mica and brass strips clamped together without any molded bakelite covering, tested 0.001  $\mu$ f. as marked and did not show any abnormal leakage.

Fig. 2 — Typical resistance calibration curves for the v.t.v.m.



## Resistance Measurement

It is apparent that, in order to check a condenser thoroughly, it should be tested for leakage resistance as well as capacity. The v.t.v.m. also lends itself very well to conversion into an ohmmeter for reading extremely high values of resistance. For this purpose the d.c. plate supply is applied to the d.c. voltmeter section through the unknown resistor in much the same manner as that previously described for measuring capacity with the a.c. section.

The internal plate-supply voltage of the instrument runs 170 volts above ground. Of this, 100 volts is tapped off on a voltage divider and applied to the 100-volt input terminals in series with the resistance to be measured. This scale reads from 1 megohm to 100 megohms and is called the *LO-OHM* scale. To read higher values of resistance the 100-volt supply is applied to the 10-volt scale through the unknown resistor, with an additional resistor of 90 megohms added in series

to limit the maximum voltage applied across the meter input to 10 volts. This scale is labelled *HI-OHMS* and it reads from 1 megohm to 1000 megohms.

The *HI-* and *LO-OHM* scales worked so well that two additional ones were added (*XLO* and *XXLO* in Fig. 2). The *XLO* scale is obtained in a manner similar to that used in the higher resistance ranges, but the input resistance of the meter had to be reduced by connecting in an additional switch point, shunted with a 12,000-ohm resistor, as shown in Fig. 1. Since some current was required to operate this section, a battery was added as the easiest way out. The *XXLO* scale is made up by using the milliammeter in a regular ohmmeter circuit with another

1½-volt battery. It is important that the power be turned off in the meter before using the latter range, since the meter is in the "B" + side and is above ground by about 170 volts. Finally, a terminal was added to the panel to supply one side of the filament voltage.

In using the 1000-megohm range it is important to keep down leakage in the test prod leads if they are used. The leakage through many insulators will be less than 1000 megohms. Newsprint paper on a damp day will show a reading if the prods are pressed on it a couple of inches apart. It is best to use a couple of bare wires pushed in the HI-OHM terminals with the condenser connected to them as close to the terminals as possible.

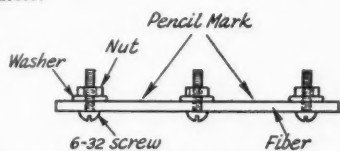


Fig. 3—Calibrating resistors for extending the range of the v.t.v.m. are constructed by making pencil marks on an insulating strip, as described in the text.

### Calibration

It turned out to be fairly easy to calibrate the meter at the high ranges. Perhaps the accuracy of the method used is less than that obtained on the best commercial bridges, but it is sufficient for our purpose.

In constructing the calibrating resistors, a piece of fiber was drilled with three holes in a row and machine screws and washers put in the holes, as shown in Fig. 3. Pencil lines were drawn from under the washers on to the next screw, making a pair of 1920-model pencil grid leaks in series. A 10-megohm resistor was obtained and one of the grid-leak sections adjusted to the same resistance as measured by the meter scale. Then the other grid-leak section was adjusted to the same resistance. Since the total resistance of both grid-leak sections is 20 megohms, the meter deflection for 20 megohms was recorded. Then each section was made 20 megohms, making a total of 40 megohms. Thus, by doubling resistance each time, the calibration was carried on up to 1200 megohms.

The resistances were adjusted by marking on a little pencil lead or erasing a little of it until the resistance was correct. The meter was calibrated at the lower ranges by plotting points from resistors which were measured by another ohmmeter of good accuracy.

The original meter as shown in November QST did not have a case, but after its conversion to read ohms and whatnot it was mounted in a wooden case and some additional terminals put on the panel, as shown in the photograph. It was a case of something that started out to be a volt-meter and ended up being a meter to read nearly everything else as well.

For something that was born on the kitchen table from parts out of the junk box, this thing turned out to be a good little instrument.

## ★ BOOK REVIEWS ★

**The Mathematics of Physics and Chemistry,** by Henry Margenau and George Mosely Murphy. Published by D. Van Nostrand Company, Inc., New York, 1943. 581 pages, 6 × 9. Price, \$6.50.

Under the stress of war many kinds of information must be made immediately available to technical people of every description, so that they may spend most of their energy on direct military applications. A physicist, for instance, whose time has been spent in the classroom or research laboratory, is suddenly called upon to design equipment to be operated at extremely high radio frequencies. Designing is out of his line and even the mathematics involved may have become a little hazy. His problem becomes one of finding the answers to his questions with the minimum of research. It is situations like this that prompted the authors of this book to gather in a single volume the mathematics used in advanced chemistry, physics and allied fields.

Beginning with a chapter on thermodynamics, we are given a discussion of the fundamental laws and an explanation of their mathematical treatment. For instance, in the general treatment there are paragraphs on the differentiation of functions of several independent variables, total differentials, higher order differentials, implicit functions, and exact differentials and line integrals. The method of using these items is shown by applying them to such equipment as van der Waals' on gases. The properties of the Jacobian and thermodynamic derivations by the use of Jacobians are taken up in detail. The principle of Caratheodory is likewise covered.

As we progress through the book, we find the treatment to be similar; i.e., the general mathematical principles are set forth in as complete form as the circumstances demand and then their application to the formulas is explained. Several chapters are devoted to such general concepts as ordinary differential equations, special functions, vector analysis and curvilinear coordinates. In many cases rigorous proofs are submitted while in others, where the subject is too extensive or, where it has been thoroughly covered by others, liberal references are made.

The general mathematical treatment of the calculus of variations, partial differentiation, equations of classical physics, eigenvalues and eigenfunctions, is followed by their specific applications. A whole chapter is devoted to the mechanics of molecules, another to quantum mechanics and still another to statistical mechanics. The mathematical methods used in mechanics are most skillfully developed by a thorough treatment of the polyatomic molecule.

According to the authors, this book is designed for graduate students and scientists whose memory of specific mathematical details may have been dimmed by disuse or time, as well as for the more adventurous student of physics and chemistry who wishes to extend his mathematical knowledge through self-study. The method of treatment is such that college seniors majoring in physics or chemistry will also be able to master most of the topics discussed. The entire book is designed to provide the essential tools needed to attack problems currently met in physics and chemistry, and to show how to use them to the best advantage.

—T.A.G.

A free booklet entitled "Trail Blazers to Radionics and Reference Guide to Ultra High Frequencies," may be obtained upon request from Zenith Radio Corp., 680 N. Michigan Ave., Chicago 11, Ill. Compiled by Elizabeth Kelsey of Zenith's engineering division, it presents the biographies of great men of science and a bibliography of books and articles regarding ultra high frequency techniques and equipment.



**T**HERE being no special items on the hook this month, we'll start right in on that familiar "song and dance" — we want more war service records! We not only *want* but *need* more. It's spring here in Old New England, and your ITS department is just full of vim and impatient to get going on lots and lots of new names for our roster. So if you're an amateur just embarking on your military career, be sure to advise us at once. If you're one of the hundreds of hams or ex-hams who got in this fight right at the beginning but have delayed writing us, please do it now. If you're a mom or dad with an OM or YL in the service, especially those who are on foreign duty and whose QSTs go home, won't you drop us a note giving the information we need?

And remember, this doesn't mean we aren't equally interested in obtaining the data on every amateur in Civil Service and in radio industry wholly devoted to the war effort — we definitely are!

You will find a more detailed account of our needs and a convenient form for filing your data with us under "Happenings of the Month," page 26. We'd be ever so pleased to see our mailbox just bulging with AWSRs, so get 'em rolling!



Soon after he was sworn into the Naval Reserve on August 6, 1913, Julius J. Willa, Jr., W3IXS, sent us this picture. He was then an apprentice seaman taking his boot training at Great Lakes Naval Training Station, Illinois. W3IXS has been a member of ARRL for several years.

## ARMY—SIGNAL CORPS

ICZC, O'Connell, S/Sgt., Ft. Monmouth, N. J.  
IHPL, Christensen, Sgt., Ft. Monmouth, N. J.  
IHDS, Grover, Lt., foreign duty.  
IHMU, Lemieux, Cpl., Ft. Monmouth, N. J.  
ILIA, Budnick, Cpl., Ft. Monmouth, N. J.  
IMWL, Jones, Cpl., Ft. Monmouth, N. J.  
ex-2AGH, Fishelberg, Sgt., Ft. Monmouth, N. J.  
ex-2BIU, Bayer, 2nd Lt., Ft. Monmouth, N. J.  
2DGO, Young, Cpl., Ft. Monmouth, N. J.  
2DWT, MacEachren, Lt. Col., Ft. Monmouth, N. J.  
2EAL, Schwartz, Pfc., foreign duty.  
2ECL, Weintraub, Cpl., Ft. Monmouth, N. J.  
2FCU, Citrin, Cpl., Ft. Monmouth, N. J.  
2GEZ, Harr, Sgt., foreign duty.  
2GLW, Feigenbaum, Sgt., Ft. Monmouth, N. J.  
2HFL, Bulova, Cpl., Ft. Monmouth, N. J.  
2JTP, Kretzman, Cpl., Ft. Monmouth, N. J.  
2KEM, Rosewitz, T/3, foreign duty.  
2LFC, Thistle, Cpl., Ft. Monmouth, N. J.



Achieving his wings via cadet training in California and Florida, Lt. Cortlandt McCoy, W5DXL, is now on foreign duty with the AAF. He was recently awarded the DFC with five oak leaf clusters for his participation in the Italian campaign.

2LPG, Albert, Cpl., Ft. Monmouth, N. J.  
2MDC, Matthews, Cpl., Ft. Monmouth, N. J.  
ex-3ANV, Bloementhal, 2nd Lt., Ft. Monmouth, N. J.  
3BIB, Hassett, S/Sgt., Ft. Monmouth, N. J.  
3DDM, Louie, T/3, foreign duty.  
3FFM, Mawby, Lt., Ft. Monmouth, N. J.  
3FSM, Needhamer, Pvt., Camp Crowder, Mo.  
3HHK, Rotondo, Sgt., Ft. Monmouth, N. J.  
3HZF, Benson, Cpl., Ft. Monmouth, N. J.  
3IAZ, Mohler, Cpl., Ft. Monmouth, N. J.  
3INC, Bartolacci, Cpl., Ft. Monmouth, N. J.  
3ISV, Einhorn, Cpl., Ft. Monmouth, N. J.  
3JZS, Weidknecht, Sgt., Ft. Monmouth, N. J.  
3ND, Manning, Capt., address unknown.  
4ARE, Renfrew, Sgt., Ft. Monmouth, N. J.  
ex-5AJB, Moore, Capt., Ft. Monmouth, N. J.  
5DIJ, Rains, M/Sgt., foreign duty.  
5EAL, Keep, Capt., Ft. Monmouth, N. J.  
5ECA, Swinney, Major, Camp Murphy, Fla.  
5ESY, Sumner, M/Sgt., Ft. Monmouth, N. J.  
ex-5ETA, Davis, T/Sgt., Ft. Monmouth, N. J.  
6KQDV, Marques, Lt., address unknown.  
6IJM, Bekkar, 2nd Lt., Ft. Monmouth, N. J.  
6LZK, Constantine, Ft. Benning, Ga.  
ex-6MQK, Muhs, Ft. Benning, Ga.  
6ORT, Hastin, Lt., foreign duty.  
6PMR, Kohn, Ft. Benning, Ga.  
6PUF, Griffith, 2nd Lt., foreign duty.  
6QIF, Pepper, Ft. Benning, Ga.  
6QNU, Jarmie, 2nd Lt., Ft. Monmouth, N. J.  
6SSQ, Cline, Pfc., address unknown.  
7CUK, Cunningham, Pvt., Camp Crowder, Mo.

7GIO, Grant, Pfc., Camp Crowder, Mo.  
ex-8AFI, Pilarsky, Pvt., Davis, Calif.  
8CWM, Gordon, S/Sgt., Ft. Monmouth, N. J.  
8DZL, Shaffer, Sgt., Ft. Monmouth, N. J.  
8GOO, Cotton, Capt., foreign duty.  
8KIL, DeMartino, Cpl., Ft. Monmouth, N. J.  
8MXT, Brunn, S/Sgt., Ft. Monmouth, N. J.  
8OIZ, Carson, Pvt., Camp Polk, La.  
8PEZ, Hyder, S/Sgt., Ft. Monmouth, N. J.  
8QWP, Sarture, Cpl., Ft. Monmouth, N. J.  
8RFA, Randall, Pvt., Camp Crowder, Mo.  
8RTQ, Crynack, Lt., foreign duty.  
8SGW, Yocum, T/5, foreign duty.  
8SRE, Jamison, Pvt., Camp Crowder, Mo.  
8TPE, Retzlaff, Sgt., Ft. Monmouth, N. J.  
8UJN, Woodin, S/Sgt., Oteen, N. C.  
8UKU, Kortvise, Lt., Ft. Monmouth, N. J.  
8VFF, Foody, Cpl., Ft. Monmouth, N. J.  
8VMV, Howe, S/Sgt., Ft. Monmouth, N. J.  
ex-8VYG, Hoke, T/Sgt., Ft. Monmouth, N. J.  
8WFN, Cronin, Sgt., Oceanside, Calif.  
8WLS, Rolenz, Cpl., Ft. Monmouth, N. J.  
8WMY, Stevens, T/5, foreign duty.  
8WPS, Stevens, Pfc., Ft. Monmouth, N. J.  
8WQE, Wagner, Sgt., Ft. Monmouth, N. J.  
8SWR, Ladzinske, W/O, foreign duty.  
9BKF, Sorge, Ft. Benning, Ga.  
9CWY, Strom, T/5, foreign duty.  
ex-9FPH, Lyons, Lt. Col., McClellan Field, Calif.  
9FUO, Schmitt, Pvt., Davis, Calif.  
9MXX, Norton, Lt., McClellan Field, Calif.  
ex-9PWG, Boe, Lt., Camp Crowder, Mo.  
9RIW, Werner, Pvt., Ft. Monmouth, N. J.  
9RMK, Ellis, Cpl., Camp Crowder, Mo.  
9SDS, Salm, Lt., Ft. Monmouth, N. J.  
9TVT, Stafford, T/5, Camp Pinedale, Calif.  
9UCW, Douma, Cpl., Ft. Monmouth, N. J.  
9YBC, Kubitschek, T/Sgt., foreign duty.  
9YWC, Hill, S/Sgt., Ft. Monmouth, N. J.  
ex-9YYQ, Baker, Capt., Arlington, Va.  
9ZHN, Kruesi, Pvt., Camp Crowder, Mo.  
9ZUG, Drake, Lt., foreign duty.

## Operator's license only:

Bagwell, 2nd Lt., address unknown.  
Bosselman, Pfc., Camp Crowder, Mo.  
Broade, San Antonio, Tex.  
Code, Sgt., foreign duty.  
Cook, Cpl., foreign duty.  
Droemer, Lt., Giddings, Tex.  
Nemeth, Pvt., Camp Crowder, Mo.  
Smith, T/4, foreign duty.  
Soule, Tyler, Tex.  
Wesley, T/4, Ft. Sam Houston, Tex.

## NAVY—AERONAUTICS

2LAT, Pellock, ARTic, foreign duty.  
4ERF, Norman, Ens., Purcell, Okla.  
6JDL, Latimer, ARTic, Moffett Field, Calif.  
8WHH, O'Shea, ARTic, address unknown.  
Operator's license only:  
Allen, ARM3c, foreign duty.  
Atteberry, Lt., Lake City, Fla.  
Lasell, A/C, Holbrook, Ariz.  
Lozer, A/C, Hamilton, N. Y.  
Smith, ARTic, San Diego, Calif.

## NAVY—SPECIAL DUTY

11QO, Mattinson, RTic, foreign duty.  
20AN, Guzzo, ARTic, Virginia Beach, Va.  
3BSB, Meetze, ARTic, Virginia Beach, Va.  
3JXV, Weitzel, RTic, Hyattsville, Md.  
4DXJ, Hawkins, ARTic, Virginia Beach, Va.  
ex-5AGC, Haydon, CRT, Virginia Beach, Va.  
5KCS, Hollowell, RTic, Treasure Island, Calif.  
5KVV, Belian, ARTic, Corpus Christi, Tex.  
6DLF, Kelly, Ens., Oakland, Calif.  
6FBQ, Nelson, CRT, Virginia Beach, Va.  
6FLT, Bryan, CRT, Treasure Island, Calif.  
6LJS, Archibald, RTic, Dayton, Ohio.  
6OAW, Snyder, RTic, Virginia Beach, Va.  
6ODY, Landess, RTic, Treasure Island, Calif.  
6QKS, Blocher, RT2c, Treasure Island, Calif.  
6UAL, Tudor, ART2c, San Diego, Calif.



M/Sgt. S. H. Beverage, W1MGP, is nearing the completion of two years overseas duty. He is serving with a signal company and was in the Middle East for a time before moving on to Italy. Along with thousands of others, he is anxiously awaiting the day he can return to the old QTH, the YL and his favorite hobby!

ex-8GPC, Vilas, ART1c, Virginia Beach, Va.  
8KLL, Spirka, RT1c, Great Lakes, Ill.  
8SGH, Smith, RT2c, address unknown.  
8UFI, Reinhold, RT1c, Treasure Island, Calif.  
9IKF, Kriebel, RT1c, Virginia Beach, Va.  
90MY, Fitten, ART3c, Corpus Christi, Tex.  
90GN, McCann, RT1c, Virginia Beach, Va.  
90WP, McAfee, RT1c, Virginia Beach, Va.  
ex-9RAL, Wiley, ART3c, Corpus Christi, Tex.  
9TBN, Pendergrass, ACRT, Corpus Christi, Tex.

#### Operator's license only:

Allen, RT3c, Washington, D. C.  
Dunn, RT3c, foreign duty.  
Wirtz, RT2c, Seattle, Wash.

#### ARMY - GENERAL

ALTHOUGH W2JOF and W2AJX used to rag-chew every Sunday, they had to go to Camp Crowder, Mo., to meet in person. When Pfc. Henry Marcus, W2AJX, transferred into the same platoon, same squad and same barracks with T/Sgt. Harry Webb, W2JOF, he couldn't miss him. Why? Because W2JOF had his call letters plainly printed on his fatigue hat!

IAPA, Williams, Pvt., Ft. Devens, Mass.  
JYT, Karasek, T/4, Ft. Benning, Ga.  
ZCZ, Bind, S/Sgt., foreign duty.  
2DRG, Messe, Capt., foreign duty.  
2NNR, Weick, T/5, Drew Field, Fla.  
300Z, Spencer, M/Sgt., New York, N. Y.  
3JNL, Joern, T/Sgt., foreign duty.  
4HEH, Smith, Pvt., Ft. Sam Houston, Tex.  
6CEC, Harwell, Lt., March Field, Calif.  
6JH, Nichols, 2nd Lt., foreign duty.  
6LLF, Hess, Pvt., Camp Fannin, Tex.  
60ZB, Twomey, Pvt., Camp Roberts, Calif.  
8GJL, Losco, T/4, Camp Livingston, La.  
80FV, Graff, S/Sgt., foreign duty.  
9APL, Frey, Lt., Temple, Tex.  
9DKG, Adams, Lt., Washington, D. C.  
9HLV, Walter, S/Sgt., foreign duty.  
9HRL, Goatcher, Pvt., Camp Roberts, Calif.  
9TSR, Olmstead, Col., address unknown.

#### Operator's license only:

Harmon, address unknown.  
Houe, Pvt., Ft. Benning, Ga.  
Isen, Sgt., foreign duty.  
Moskowitz, Pfc., Boca Raton Field, Fla.  
Pasciutti, T/5, Ft. Sill, Okla.  
Schlang, Pvt., Camp Carson, Colo.  
Talcott, Pvt., Camp Blanding, Fla.  
Tartaglio, Sgt., foreign duty.  
Tracy, Cpl., Camp Roberts, Calif.

#### NAVY - GENERAL

WE'RE running short on group pictures, OMs! You know, there's nothing quite as heart-warming as a gang of amateurs all in the same regiment or all going to school together, as in the picture on the following page. Can you help us out? We know many of you are far too busy to be posing for snapshots, but if you already have some on hand or have an opportunity to round up the gang for a "quickie," we'd be most grateful.

ex-1JMS, Goss, CRM, Port Isabel, Tex.  
1LRC, Richard, RM3c, foreign duty.  
2BIX, Allen, RM2c, foreign duty.  
ex-2GRL, Richmond, Ens., Washington, D. C.  
ex-2HXB, O'Neil, RE, Washington, D. C.  
2JYT, Astley, Lt. (jg), foreign duty.  
20GW, Kopp, foreign duty.  
3FJZ, Shaw, S2c, Chicago, Ill.  
3JVM, De La Matyr, Lt., Washington, D. C.  
ex-3RE, Brink, Michigan City, Ind.  
4DD, Buckley, CM1c, foreign duty.  
4EEW, Miller, S1c, Gulfport, Miss.  
4HYB, Mangum, A/S, Dickinson, N. D.  
ex-5AQT, Long, Lt., Washington, D. C.  
5HMZ, Beavers, address unknown.  
5HNG, Nisle, Ens., Washington, D. C.  
ex-5IHO, Gibbons, S2c, Boulder, Colo.  
5IPC, Yarbrough, Lubbock, Tex.  
5IYZ, Gallant, ACRM, foreign duty.  
5JQS, Deer, Ens., Washington, D. C.  
6ATM, Edwards, Lt., foreign duty.  
6HAC, LeGrand, Ens., Washington, D. C.  
6IWS, Steffens, RM2c, foreign duty.  
K6KYI, Alverson, Lt. Comdr., address unknown.

6LLU, Mercer, Lt., Washington, D. C.  
6LVD, Tuckey, Ens., Washington, D. C.  
6KNZQ, Seymour, Lt., foreign duty.  
60ZN, Lithgow, Lt., foreign duty.  
7KXJ, Ransopher, ARM1c, Seattle, Wash.  
7BOC, Stanley, Ens., Brunswick, Maine.  
7BPI, Frye, Stillwater, Okla.  
7BQG, Hamer, S1c, Great Lakes, Ill.  
ex-7BSS, Sullivan, RE, Bremerton, Wash.  
ex-7DPR, Jett, CRM, Quincy, Mass.  
7GAX, Lorezn, Ens., Washington, D. C.  
7IAY, Voden, RM1c, Port Blakely, Wash.  
8PCW, Burton, S2c, Gulfport, Miss.  
8PSF, Myers, Ens., Washington, D. C.  
8BVC, Hammone, EM3c, Newport, R. I.  
8VDD, Weyzandt, S1c, Chicago, Ill.  
8WOR, Heenan, RM2c, foreign duty.  
9AMR, Merdian, Lt. (jg), address unknown.  
9EMB, Van Slyke, Midshipman, Notre Dame, Ind.  
9FCH, Eisfeldt, RM1c, foreign duty.  
9HTW, Johnson, Ens., Minneapolis, Minn.  
9JDA, Carlson, S1c, San Francisco, Calif.  
9JID, Guimont, S2c, Farragut, Idaho.  
9PRC, Eichhorn, Lt., Washington, D. C.  
9QWL, Schmidt, S1c, Great Lakes, Ill.  
9RQE, Parcels, Lt., foreign duty.  
9ULN, Jensen, Ens., Washington, D. C.  
9ZAN, Eckels, S2c, Memphis, Tenn.

#### Operator's license only:

Backman, S1c, Stillwater, Okla.  
Crandall, S1c, Evanston, Ill.  
Diebold, A/S, Lafayette, Ind.  
King, S1c, Del Monte, Calif.  
Lorona, S1c, Del Monte, Calif.  
Murphy, A/S, Worcester, Mass.

Pictured in front of the plane they use to flight check radio ranges, etc., are Maj. James W. Spratlin, W4KV, and Capt. Ralph W. Kiser, W4FYP. They are regional communications control officer and assistant regional communications control officer, AACS, respectively. Both were in radio work before entering service.

Official U. S. Signal Corps Photograph

#### ARMY - AIR FORCES

1BGT, Fiechthorn, Pvt., Rome Field, N. Y.  
1IBK, Nelson, Sgt., address unknown.  
1JEQ, Chambers, Pvt., Ft. Dix, N. J.  
1NIC, Grinovich, S/Sgt., foreign duty.  
1NJF, Paterak, 2nd Lt., Chatham Field, Ga.  
2LRV, Murray, Cpl., Scott Field, Ill.  
2NBA, Anderson, Lt., Brunning Field, Nebr.  
2NGP, Halter, A/C, Maxwell Field, Ala.  
2NHO, Warren, Lt., Ft. Dix, N. J.  
2NVA, Arvay, 2nd Lt., Bradley Field, Conn.  
4DDU, Singleton, T/Sgt., foreign duty.  
4DXP, Colbert, Sgt., foreign duty.  
5DJF, Hearne, Lt., Lake Charles, La.  
4DZK, Pendley, Lt., Cochran Field, Ga.  
5ENH, Hymel, Cpl., DeRidder, La.  
5FMV, Roberts, S/Sgt., foreign duty.  
5JFS, Crum, Sgt., Lockbourne Field, Ohio.  
5JXQ, Thompson, S/Sgt., foreign duty.  
60AD, King, S/Sgt., Ellington Field, Tex.  
ex-6QM, Nelson, Pvt., Camp Murphy, Fla.  
6QPE, Rubin, S/Sgt., Holtville, Calif.  
6SOV, Laub, Pfc., Camp Murphy, Fla.  
6TRA, Jorgensen, Pfc., Teppenish, Wash.  
6TSI, Ruggeri, Pvt., address unknown.  
6TJQ, Davis, T/Sgt., foreign duty.  
7PI, Lieske, Pvt., address unknown.  
7IYM, Faris, S/Sgt., foreign duty.  
ex-8BFE, Harrington, Cpl., Ft. Lauderdale, Fla.  
ex-8GP, Gerke, S/Sgt., address unknown.  
8HSC, Cunningham, S/Sgt., foreign duty.  
8NAP, Green, Sgt., Bradley Field, Conn.  
8OQR, Heinzman, T/4, foreign duty.  
8PFK, Frisbee, Pvt., Sheppard Field, Tex.  
8QIH, Sloane, Cpl., Scott Field, Ill.  
8SLA, Frost, Sgt., foreign duty.  
8TFT, Stanick, S/Sgt., Stuttgart Field, Ark.  
8TNW, Stroya, A/C, Spence Field, Ga.  
8UDI, Gaiser, Pvt., Miami Beach, Fla.  
8UGE, Flowers, Lt., Wright Field, Ohio.  
8ULT, House, Pvt., Camp Luna, N. M.  
8VHJ, Pickering, A/C, Courtland, Ala.  
8WEU, Mauro, A/C, San Antonio, Tex.  
8WHT, Niemi, S/Sgt., Freeman Field, Ind.  
9BAX, Dille, 2nd Lt., address unknown.  
9BJZ, Baldrige, Lt., Delray Beach, Fla.  
9DDJ, Hamilton, Lt., Delray Beach, Fla.  
9EBH, Schuster, Lt., Delray Beach, Fla.  
9FNY, Simpson, Lt., Delray Beach, Fla.  
9GBM, Arseneau, M/Sgt., Pompano, Fla.  
9GGF, Ingling, Lt., Boca Raton Field, Fla.  
9HZO, Hackstock, Pfc., address unknown.  
9IKD, Forster, Pvt., Robins Field, Ga.  
9JUD, Bailer, Pvt., Scott Field, Ill.  
9LFI, Tkach, A/C, Selman Field, La.  
9LPL, Kangas, A/S, Spring Hill, Ala.  
9MVP, Booker, Pfc., Will Rogers Field, Okla.  
9PPT, Parke, Sgt., Scott Field, Ill.  
9PSF, Riggs, Sgt., foreign duty.  
9UWX, Galitz, Pvt., Truax Field, Wis.  
ex-9VTA, McMillan, Pfc., address unknown.  
9WPI, Brock, Sgt., Boca Raton Field, Fla.  
9YOJ, Bishop, Cpl., address unknown.  
9ZPQ, Sperath, Sgt., Delray Beach, Fla.  
9ZQT, Grigg, T/Sgt., foreign duty.



## MERCHANT MARINE AND MARITIME SERVICE

1GWK, Turner; 1JFV, Dicken; 2NPN, Boardman; 2NYC, French; 2NZL, Zahardis; 3DYI, Carroll; 3JJE, Smith; 3JZF, Campbell; 3JAK, Jankauskas; 5DLF, Hamner; 5GKP, Craig; 5IIA, Lodato; 5KQA, Holzenthal; ex-6PT, Oldaker; 6JBP, Lundstedt; 6RWI, Jolly; 6SUH, Strawn; 6TBP, Hans; 7HWZ, Arthur; ex-8FQQ, Davy; 8OUQ, Baker; 8RN, Lohner; 8UTL, Patrick; 8WAF, Hall; 9AKK, Oliver; 9GMO, Diehl; 9YAH, Woertendyke; and 9YWE, Andrews.

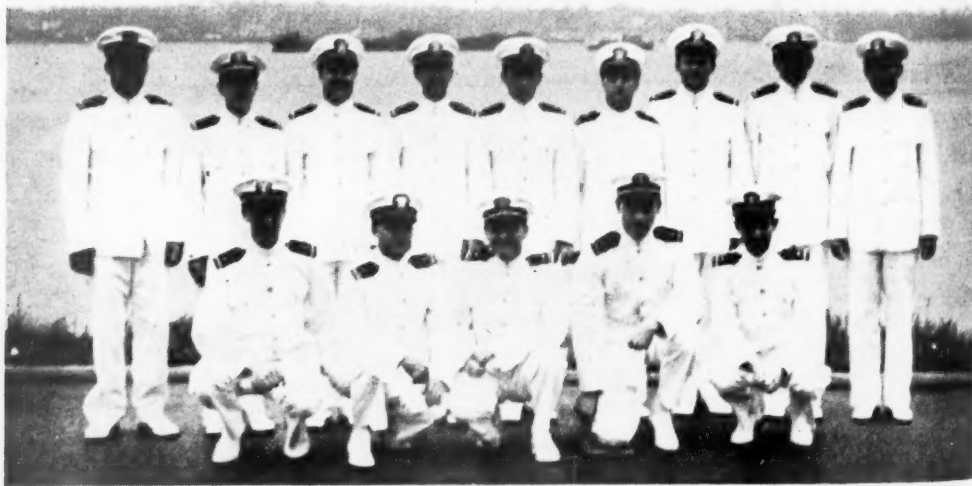
Barthold, Hammond, Ruedisueli, and Stover hold operator's license only.

## CIVIL SERVICE

1ABX, Kulikowski, NRL, Washington, D. C.  
1BKO, Bailey, NRL, Washington, D. C.  
1BRA, Van Heiningen, AAF, instructor, Delray Beach, Fla.  
1CHY, Schaller, NRL, Washington, D. C.  
1DEI, Wilson, NRL, Washington, D. C.  
ex-1FML, Mazur, Navy Dept., Philadelphia, Pa.  
1HKK, Atchley, NRL, Washington, D. C.  
1HAN, Eklund, Navy Dept., Philadelphia, Pa.  
1JJD, Mellen, NRL, Washington, D. C.  
1IWA, Glover, NRL, Washington, D. C.  
1JUM, Jewell, NRL, Washington, D. C.  
1KMC, Emerson, NRL, Washington, D. C.  
1KUP, Kelly, NRL, Washington, D. C.  
1NAJ, Seaverns, AAF, radio mechanic, Oakland, Calif.  
1NMW, Meld, Navy Dept., Philadelphia, Pa.  
1PQ, Lawson, OWI, foreign duty.  
ex-1XA, McEachren, SC, radio repairman, San Francisco, Calif.  
2AAJ, Culicover, AAF, instructor, Fort Lauderdale, Fla.  
ex-2ATM, Trevor, NRL, Washington, D. C.  
2CMY, Bondy, OWI, foreign duty.  
2DTM, Katzin, NRL, Washington, D. C.  
2GOM, Wilson, NRL, Washington, D. C.  
2IKA, Powles, NRL, Washington, D. C.  
2IQN, Harris, NRL, Washington, D. C.  
2IVM, Clark, NRL, Washington, D. C.  
2KHF, Lucas, NRL, Washington, D. C.  
2KRB, Weintraub, SC, radio engineering aide, Red Bank, N. J.  
2LXI, Saunders, Navy Dept., Philadelphia, Pa.  
3AGU, Kahler, NRL, Washington, D. C.  
ex-3ALN, Hastings, NRL, Washington, D. C.  
3AOC, Shaw, instructor, Philadelphia, Pa.  
3AOD, Hensell, NRL, Washington, D. C.  
3APX, Neth, instructor, Philadelphia, Pa.  
3BNW, Abel, NRL, Washington, D. C.

3BOF, Harrison, NRL, Washington, D. C.  
3BPO, Parks, Navy Dept., radio engineer, Camden, N. J.  
ex-3CEK, Bryant, NRL, Washington, D. C.  
3DDR, Stupp, Navy Dept., radio engineer, Collingswood, N. J.  
3DEU, Crist, Navy Dept., inspector, Camden, N. J.  
3DZ, Callaghan, Navy Dept., Philadelphia, Pa.  
ex-3EFX, Dolbear, SC, Drew Field, Fla.  
3EUM, Strong, NRL, Washington, D. C.  
3FFP, Mawby, Navy Dept., inspector, Merchantville, N. J.  
3KFF, Small, NRL, Washington, D. C.  
3FOR, Rakestraw, AAF, Ft. Lauderdale, Fla.  
3GAC, Smith, NRL, Washington, D. C.  
3GOH, Chitty, NRL, Washington, D. C.  
3HDA, Engelmann, NRL, Washington, D. C.  
ex-3HN, Gates, Navy Dept., Philadelphia, Pa.  
3IHR, Schlesinger, NRL, Washington, D. C.  
3IRD, Clark, NRL, Washington, D. C.  
3IZQ, Krider, NRL, Washington, D. C.  
3JBE, Grider, Navy Dept., Philadelphia, Pa.  
3JEO, Lewis, AAF, instructor, Boca Raton Field, Fla.  
3JFF, Ware, NRL, Washington, D. C.  
3JQJ, Marsh, Navy Dept., inspector, Audubon Village, N. J.  
3JMC, George, NRL, Washington, D. C.  
3JSP, Weimer, NRL, Washington, D. C.  
3JUQ, Wilson, NRL, Washington, D. C.  
3RL, Peck, NRL, Washington, D. C.  
4AJI, Smith, NRL, Washington, D. C.  
4CGG, Butts, Navy Dept., radio mechanic, Jacksonville, Fla.  
4DZB, Ware, NRL, Washington, D. C.  
4EFL, Russell, NRL, Washington, D. C.  
4EQJ, Harwell, CAA, Ft. Worth, Tex.  
4ERG, White, NRL, Washington, D. C.  
4GSA, Johnson, SC, radio mechanic, Warner Robins Field, Ga.  
4GUS, Collette, FCC, junior monitoring officer.  
4HAP, Fuller, NRL, Washington, D. C.  
4HUE, Andrews, NRL, Washington, D. C.  
4JM, Vermillion, AAF, radio electrician, Lake Worth, Fla.  
5ANR, Denniston, radio operator, Camp Chaffee, Ark.  
5ATH, Palmer, NRL, Washington, D. C.  
5BKK, Edinborgh, NRL, Washington, D. C.  
5BTK, Scharpwinkel, AAF, Oakland, Calif.  
5CEA, Edwards, SC, Newark, N. J.  
5DMJ, Jones, NRL, Washington, D. C.  
5DNX, Warren, SC, radio operator, Camp Robinson, Ark.  
5EKN, Gibson, NRL, Washington, D. C.

5ERD, Old, CAA, aircraft communicator, Oklahoma City, Okla.  
ex-5FJH, Buckelew, NRL, Washington, D. C.  
5FJV, Collup, NRL, Washington, D. C.  
5FVZ, Godbey, NRL, Washington, D. C.  
5GEC, Collup, NRL, Washington, D. C.  
5GEE, Clark, NRL, Washington, D. C.  
5HHS, Muirhead, SC, radio mechanic, Greenville, Miss.  
5HKM, Hunsicker, NRL, Washington, D. C.  
ex-5HMF, Williams, CAA, Waco, Tex.  
5IOA, McKinney, FCC, monitoring officer.  
5JCZ, Epperson, NRL, Washington, D. C.  
5JRL, Austin, NRL, Washington, D. C.  
5KDN, Sees, NRL, Washington, D. C.  
5KQE, Williams, FCC, junior monitoring officer.  
5RQ, Lovejoy, NRL, Washington, D. C.  
ex-6AD, Schmidt, SC, San Francisco, Calif.  
6AEH, Bertolotti, SC, radio repairman, San Francisco, Calif.  
6ATN, Smart, SC, radio engineer, McClellan Field, Calif.  
6AWB, Gregory, AAF, radio engineer, Oakland, Calif.  
6BDN, Brown, SC, associate radio engineer, Redwood City, Calif.  
6BHL, Field, CAA, engineer, foreign duty.  
6BIP, Bachman, AAF, associate radio engineer, Oakland, Calif.  
6BXO, Leslie, NRL, Washington, D. C.  
ex-6CUI, Leppert, NRL, Washington, D. C.  
6CUW, Milligan, AAF, radio mechanic, Oakland, Calif.  
ex-6DOZ, Smith, NRL, Washington, D. C.  
6EBM, Hovespian, SC, radio mechanic, Berkeley, Calif.  
6EFR, Wright, NRL, Washington, D. C.  
6FXL, Goepfinger, NRL, Washington, D. C.  
6GWE, Bisuata, SC, radio repairman, Oakland, Calif.  
6GXQ, Martin, AAF, radio engineer, Oakland, Calif.  
6HFS, Christenson, SC, radio mechanic, McClellan Field, Calif.  
6HFT, Callahan, SC, Kentfield, Calif.  
6HOT, Keefer, CAA, engineer, foreign duty.  
6HYN, Post, NRL, Washington, D. C.  
ex-6IWL, Williams, SC, engineering aide, San Francisco, Calif.  
6JRS, Shelton, SC, senior repairman, San Francisco, Calif.  
6KGZ, Begley, NRL, Washington, D. C.  
6KNF, Baird, NRL, Washington, D. C.  
6KNH, Schoenfeld, Navy Dept., radio inspector, San Francisco, Calif.  
6LBC, Seward, SC, radio engineer, Sacramento, Calif.



On graduation day the amateurs who were in the Naval Reserve School of Indoctrination, Class 13, at Fort Schuyler, N. Y., gathered together for a final hamfest before departing to carry out their individual orders. Fourteen of them, representing almost every district in the U. S. A., joined up for this picture. *Front row, l. to r.:* Ens. J. E. Gayton, W9REO; Lt.(jg) M. Hasse, W9DKJ; Lt.(jg) E. J. Roberts, jr., ex-W9DBM; Ens. S. O. Bailey, W8VGO, and Ens. R. H. Page, W1KLB. *Back row, l. to r.:* Ens. J. A. Salin, W3FKT; Ens. P. H. Lee, W8EWP; Ens. W. T. Hogue, ex-W5CDA; Lt.(jg) W. S. Keen, W8WJA; Ens. E. H. Ritter, W6NJA; Lt.(jg) C. Henry, W5BEJ; Ens. W. O. Small, OPLO; Ens. R. G. Boyd, W6TQA, and Lt.(jg) J. G. Lewis, W5CWY.



**Radio Officer Dudley N. Dixon, W6MBS**, became a licensed amateur in 1935 and roamed the ham bands until 1938, when he started roaming the sea. This picture was taken at his operating position on a return trip from the Orient. He turned landlubber for a spell to work at the oldest coastal station on the West Coast, but he's now back at sea.

K6LIA, Medeiros, CAA, engineer, foreign duty.  
 6LZL, Moulin, SC, engineering aide, San Francisco, Calif.  
 ex-6MLJ, Hirni, SC, radio mechanic, Berkeley, Calif.  
 K6MVA, Lowe, SC, engineer, foreign duty.  
 6MYT, Hartshorn, AAF, radio mechanic, Oakland, Calif.  
 6NFK, Smaus, NRL, Washington, D. C.  
 6NUD, Kauke, NRL, Washington, D. C.  
 6NYA, Stanky, NRL, Washington, D. C.  
 6PGL, Mack, NRL, Washington, D. C.  
 6PMV, Thompson, NRL, Washington, D. C.  
 6POH, Peterson, SC, radio mechanic, McClellan Field, Calif.  
 6PSZ, Baer, SC, San Francisco, Calif.  
 6QHA, Dowler, SC, senior radio mechanic, Brisbane, Calif.  
 6QHT, Campbell, NRL, Washington, D. C.  
 6QKV, Douglas, SC, radio mechanic, McClellan Field, Calif.  
 6QQW, Hays, SC, senior mechanic, San Francisco, Calif.  
 6RIH, Watterson, NRL, Washington, D. C.  
 6RMF, Sabourin, CAA, Ft. Worth, Tex.  
 6RQU, Kahl, AAF, senior radio mechanic, Oakland, Calif.  
 6SMV, Tippet, SC, radio mechanic, San Francisco, Calif.  
 6TEK, Sachs, AAF, inspector, Oakland, Calif.  
 6TJV, Laub, March Field, Calif.  
 6TMA, Kelsheimer, CAA, Ft. Worth, Tex.  
 6TZL, Conrad, AAF, mechanic, San Bernardino, Calif.  
 6UQ, Thompson, AAF, engineer, Oakland, Calif.  
 6VJ, Fortier, SC, senior radio repairman, San Francisco, Calif.  
 ex-6XW, Buckingham, AAF, radio engineer, McClellan Field, Calif.  
 ex-7AZ, Hazel, SC, senior radio mechanic, Berkeley, Calif.  
 7EQR, Talbot, NRL, Washington, D. C.  
 7FER, Durant, SC, radio engineer, Dayton, Ohio.  
 7FVM, Bechman, CAA, Ft. Worth, Tex.  
 7GV, Clausen, CAA, Ft. Worth, Tex.  
 7HIB, Thompson, NRL, Washington, D. C.  
 ex-7HRK, Karns, CAA, chief aircraft communicator, Sidney, Nebr.  
 7IIL, Bustard, communications assistant, Missoula, Mont.  
 7IKQ, Cody, CAA, aircraft communicator, Ephrata, Wash.  
 7MB, Henrich, SC, radio engineer, foreign duty.  
 8AU, DeLaFleur, FCC, monitoring officer.  
 ex-8AXK, Walker, NRL, Washington, D. C.  
 8BBK, Fraser, NRL, Washington, D. C.  
 8CF, Roess, NRL, Washington, D. C.  
 8CWW, Kuder, NRL, Washington, D. C.  
 ex-8DR, Martin, SC, radio mechanic, San Francisco, Calif.

8EWO, Tayler, SC, radio engineer, Detroit, Mich.  
 8FFU, Williams, FCC, junior monitoring officer.  
 8JMR, McDowell, NRL, Washington, D. C.  
 8JSY, Andrews, NRL, Washington, D. C.  
 8KDM, Thornton, NRL, Washington, D. C.  
 8KQX, Kelley, SC, inspector, Salem, Mass.  
 8LBR, Richards, NRL, Washington, D. C.  
 ex-8LCW, Maxwell, radio operator, Alexandria, Va.  
 8LLW, Broughall, NRL, Washington, D. C.  
 8MSK, Bissell, NRL, Washington, D. C.  
 8ODT, Parker, NRL, Washington, D. C.  
 8ODU, Pfitzer, NRL, Washington, D. C.  
 8OOD, Franklin, CAA, radio electrician, Columbus, Ohio.  
 8PMI, Fraumann, NRL, Washington, D. C.  
 8PPP, Flarity, NRL, Washington, D. C.  
 8PSF, Myers, NRL, Washington, D. C.  
 8PVS, McClood, NRL, Washington, D. C.  
 8QCL, Hritsko, radio inspector, Columbus, Ohio.  
 8RLA, Bitner, Navy Dept., Philadelphia, Pa.  
 8RWX, Ryeroft, NRL, Washington, D. C.  
 8SAW, Brinkman, NRL, Washington, D. C.  
 8SCU, Longman, NRL, Washington, D. C.  
 8UBH, Okonski, NRL, Washington, D. C.  
 8UIQ, Lance, NRL, Washington, D. C.  
 8UJX, Messenger, engineer, Aberdeen Proving Ground, Md.  
 8UPS, Cox, NRL, Washington, D. C.  
 8UUU, Osburn, NRL, Washington, D. C.  
 8VJJ, Jones, Navy Dept., Philadelphia, Pa.  
 8VJL, Wright, NRL, Washington, D. C.  
 8VPC, Seddon, NRL, Washington, D. C.  
 8WAX, Gilchrist, NRL, Washington, D. C.  
 9ALO, DeWitt, NRL, Washington, D. C.  
 ex-9AYM, Taylor, AAF, radio engineer, Oakland, Calif.  
 9AZV, Hall, CAA, aircraft communicator, foreign duty.  
 9BAF, Volz, War Dept., Lemay, Mo.  
 ex-9BLC, Lorenzen, NRL, Washington, D. C.  
 9BRE, Maxwell, Navy Dept., Philadelphia, Pa.  
 9BTC, Bauer, FCC, monitoring officer.  
 9CER, Beck, NRL, Washington, D. C.  
 9CFW, Van Note, FCC, junior monitoring officer.  
 9CCA, Bacon, War Dept., Cleveland, Ohio.  
 9CMM, Rector, Navy Dept., Philadelphia, Pa.  
 9DED, DeHart, NRL, Washington, D. C.  
 ex-9DQG, Shonts, Navy Dept., Philadelphia, Pa.  
 9DGS, Langer, CAA, Alexandria, Minn.  
 9DOY, Holaday, FCC, Galveston, Tex.  
 9DUN, Smith, NRL, Washington, D. C.  
 9DVT, Bernert, NRL, Washington, D. C.  
 9EBB, Nan, NRL, Washington, D. C.  
 9ECI, Wheeler, Navy Dept., Philadelphia, Pa.  
 9EGI, Koth, NRL, Washington, D. C.  
 9FNI, Pondrom, Navy Dept., Philadelphia, Pa.  
 9GAZ, Stodden, CAA, Ft. Worth, Tex.  
 9CGN, Bartling, SC, radio mechanic, San Francisco, Calif.  
 9GHY, Pawley, NRL, Washington, D. C.  
 9ICT, Danna, Navy Dept., Philadelphia, Pa.  
 9ITA, Arnold, Navy Dept., Philadelphia, Pa.  
 9IVT, Andrew, NRL, Washington, D. C.  
 9IYL, Watt, CAA, Ft. Worth, Tex.  
 9IYY, Arlton, AAF, Sioux Falls, S. D.  
 9LFG, Post, AAF, instructor, Ft. Lauderdale, Fla.  
 9LKN, Burnett, NRL, Washington, D. C.  
 9MCG, Euster, NRL, Washington, D. C.  
 9MJK, Herman, NRL, Washington, D. C.  
 9MQT, Green, NRL, Washington, D. C.  
 9NIM, Craig, NRL, Washington, D. C.  
 9NLP, Long, Navy Dept., Philadelphia, Pa.  
 9NOE, Burlison, AAF, instructor, Ft. Lauderdale, Fla.  
 9OHG, Wehrmann, AAF, instructor, Delray Beach, Fla.  
 9PFY, Debel, NRL, Washington, D. C.

As a more potent indication of the hospitality being extended our OMs on foreign duty, we have this picture of A. Quintrie, FY8AA, and CWO John J. Carr, W2HCJ. W2HCJ is serving with the AAF and visited FY8AA while on a short pleasure trip down French Guiana way.

## HAM HOSPITALITY

**WE ARE** delighted to be able to publish a number of new names and addresses under this heading this month. Starting off the list is VE3AEJ, to our recollection the first Canadian to write us seeking mention in this section. He is among those who have had to remain at home to carry on in war work and is very much interested in having any radio amateur who finds himself in Toronto call on him. Herewith, his full name and QTH:

Orval Anderson, VE3AEJ  
 250 Oakwood Avenue, Apt. 18  
 Toronto, Ontario, Canada  
 Telephone: LI. 3831

The others are New Zealanders who would be glad to welcome any Ws who get down around that part of the globe. W. D. Gorman, ZL2IY, Secretary of the New Zealand Association of Radio Transmitters, Inc., says they have only a few so far as they seem hard to locate. The door is on the latch for any visiting American amateurs at the following addresses:

H. W. Batty, ZL1HQ  
 Hinemoa Street  
 Birkenhead, N5, Auckland

W. D. Gorman, ZL2IY  
 27 Kenwyn Terrace  
 Newtown, Wellington  
 Bus. phone: 47-800, ext. 854

L. Petrie, ZL2OV  
 127 Coromandel Street  
 Newtown, Wellington  
 Business phone: 46-000

J. Freeman, ZL3FB  
 164 Aldwins Road  
 Christchurch



# Practical Applications of Simple Math

## Part II—Plate and Screen Voltages

BY EDWARD M. NOLL,\* EX-W3FQJ

**W**HENEVER the d.c. plate current flows through any resistance placed in the plate circuit of a vacuum tube as a load or coupling medium, it is obvious that the voltage at the plate will be less than the supply voltage because of the voltage drop across the resistance.

In Fig. 1 the plate voltage is

$$E_p = E_b - R_p I_p$$

*Example:* In Fig. 1,  
 $E_b = 250$  volts.  $R_p = 10,000$  ohms.  
 $I_p = 10$  ma. (0.01 amp.).

What is the plate voltage,  $E_p$ ?

$$E_p = 250 - (10,000)(0.01) = 250 - 100 = 150 \text{ volts.}$$

Since true plate voltage is the voltage between plate and cathode, the voltage drop across the cathode resistor,  $R_k$  in Fig. 2, as well as the drop across the plate resistor,  $R_p$ , must be subtracted from the supply voltage in calculating plate voltage.

In Fig. 2 the plate voltage is

$$E_p = E_b - I_p R_p - I_p R_k \\ = E_b - I_p (R_p + R_k).$$

*Example:* In Fig. 2,

$$E_b = 250 \text{ volts.}$$

$$R_p = 25,000 \text{ ohms.}$$

$$R_k = 2,000 \text{ ohms.}$$

$$I_p = 5 \text{ ma. (0.005 amp.).}$$

What is the plate voltage,  $E_p$ ?

$$E_p = 250 - (0.005)(25,000 + 2,000) \\ = 250 - (0.005)(27,000) = 250 - 135 = 115 \text{ volts.}$$

One advantage of transformer coupling between audio-amplifier stages is that the inductance of the transformer primary winding will provide a high-impedance load for the tube at audio frequencies, while the d.c. resistance of the winding is sufficiently low to cause only a small drop in d.c. plate voltage.

In Fig. 3 the only resistance affecting the plate voltage is that of the transformer primary winding,  $R_t$ , so

$$E_p = E_b - I_p R_t.$$

*Example:* In Fig. 3,

$$E_p = 250 \text{ volts. } I_p = 20 \text{ ma. (0.02 amp.)}$$

$$R_t = 100 \text{ ohms.}$$

What is the plate voltage,  $E_p$ ?

$$E_p = 250 - (0.02)(100) = 250 - 2 = 248 \text{ volts.}$$

Screen voltage is determined in the same manner as plate voltage, using the screen current to calculate the voltage drop across the screen resistor.

$$E_p = E_b - I_p R_p \\ E_s = E_b - I_s R_s.$$

*Example:* In Fig. 4,

$$E_b = 250 \text{ volts. } I_p = 5 \text{ ma. (0.005 amp.).}$$

$$R_p = 20,000 \text{ ohms. } I_s = 2 \text{ ma. (0.002 amp.).}$$

$$R_s = 75,000 \text{ ohms.}$$

What are the plate voltage,  $E_p$ , and screen voltage,  $E_s$ ?

$$E_p = 250 - (0.005)(20,000) = 250 - 100 = 150 \text{ volts.}$$

$$E_s = 250 - (0.002)(75,000) = 250 - 150 = 100 \text{ volts.}$$

In the circuit of Fig. 5 both plate and screen currents flow through the common resistor,  $R_1$ , so that plate and screen currents must be added in calculating the voltage drop across  $R_1$ .

$$E_p = E_b - (I_p + I_s)(R_1) - I_p R_p \\ E_s = E_b - (I_p + I_s)(R_1) - I_s R_s.$$

*Example:* In Fig. 5,

$$E_b = 250 \text{ volts. } R_p = 40,000 \text{ ohms.}$$

$$R_s = 200,000 \text{ ohms. } I_p = 2 \text{ ma. (0.002 amp.)}$$

$$I_s = 0.5 \text{ ma. (0.0005 amp.). } R_1 = 20,000 \text{ ohms.}$$

What are the plate voltage,  $E_p$ , and screen voltage,  $E_s$ ?

$$E_p = 250 - (0.002 + 0.0005)(20,000) \\ - (0.002)(40,000) \\ = 250 - 50 - 80 = 120 \text{ volts.}$$

$$E_s = 250 - 50 - (0.0005)(200,000) \\ = 250 - 50 - 100 = 100 \text{ volts.}$$

In the circuit of Fig. 6-A, the screen voltage,  $E_s$ , is obtained from a tap on a voltage divider consisting of  $R_a$  and  $R_b$ . The equivalent circuit is shown in Fig. 6-B. The screen voltage,  $E_s$ , is equal to the voltage drop across  $R_b$ . Therefore,

$$E_s = R_b I_s.$$

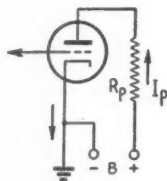


Fig. 1

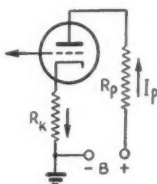


Fig. 2

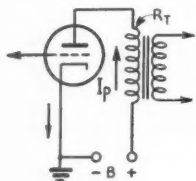


Fig. 3

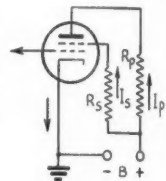


Fig. 4

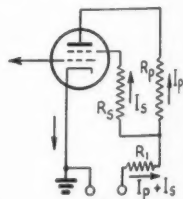


Fig. 5

\* 117 S. Woodlawn Ave., Clifton Heights, Pa.

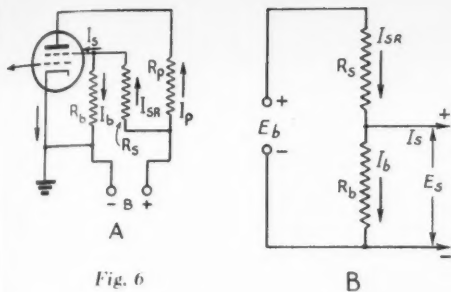


Fig. 6

Example: In Fig. 6-B,

$$E_b = 250. I_s = 1 \text{ ma. } R_s = 10,000 \text{ ohms.}$$

$$R_b = 40,000 \text{ ohms.}$$

What is the screen voltage,  $E_s$ ?

$$E_s = I_b R_b.$$

Since  $E_b$  is equal to the sum of the voltages across  $R_s$  and  $R_b$ ,

$$E_b = R_s I_{sr} + R_b I_b.$$

Also, since both  $I_b$  and  $I_s$  must flow through  $R_s$ ,

$$I_{sr} = I_b + I_s.$$

Substituting this value for  $I_{sr}$  in the above equation,

$$E_b = R_s (I_b + I_s) + R_b I_b.$$

Transposing,

$$R_s I_b + R_b I_b = E_b - R_s I_s$$

$$I_b (R_s + R_b) = E_b - R_s I_s$$

$$- R_s I_s$$

$$I_b = \frac{E_b - R_s I_s}{R_s + R_b}.$$

Substituting known values,

$$I_b = 250 - \frac{(10,000)(0.001)}{10,000 + 40,000}$$

$$= \frac{250 - 10}{50,000} = \frac{240}{50,000} = 0.0048 \text{ amp.}$$

Then,

$$E_s = (0.0048)(40,000) = 192 \text{ volts.}$$

In the circuit of Fig. 7, both screen and grid-biasing voltages are taken from voltage dividers. In the case of the divider in the grid circuit, the voltage division is in exact proportion to the resistance values of the divider sections, since it is assumed that the grid is biased so that no grid current flows. Therefore, the grid-biasing voltage,  $E_g$ , is the voltage developed across  $R_2$  by virtue of the current flowing through it from the bias supply.

$$E_g = I_g R_2$$

$$I_g = \frac{E_c}{R_1 + R_2}, E_c \text{ being the bias-supply voltage.}$$

$$\text{Substituting, } E_g = \frac{E_c R_2}{R_1 + R_2}.$$

Screen and plate voltages are calculated as before.

Example: In Fig. 7,

$$E_b = 250 \text{ volts. } E_c = 100 \text{ volts.}$$

$$R_1 = 49,000 \text{ ohms.}$$

$$R_2 = 1000 \text{ ohms. } R_3 = 30,000 \text{ ohms.}$$

$$R_4 = 20,000 \text{ ohms. } R_5 = 20,000 \text{ ohms.}$$

$$I_s = 1 \text{ ma. (0.001 amp.).}$$

$$I_p = 5 \text{ ma. (0.005 amp.).}$$

What are the grid-biasing, screen and plate voltages?

$$E_g = \frac{(100)(1000)}{49,000 + 1000} = \frac{100,000}{50,000}$$

$$= 2 \text{ volts (negative in respect to cathode).}$$

$$E_p = 250 - (0.005)(20,000) = 250 - 100$$

$$= 150 \text{ volts.}$$

$$E_s = I_b R_3$$

$$I_b = \frac{E_b - R_4 I_s}{R_4 + R_3} \text{ (see text referring to Fig. 6).}$$

$$I_b = \frac{250 - (20,000)(0.001)}{20,000 + 30,000} = \frac{230}{50,000}$$

$$= 0.0046 \text{ amp.}$$

$$E_s = (0.0046)(30,000) = 138 \text{ volts.}$$

Fig. 8 is used to illustrate the effects of low voltmeter resistance upon the accuracy of voltage measurements.  $R_m$  is the meter resistance.

With the meter disconnected, the plate voltage will be

$$E_p = E_b - R_p I_p.$$

However, with the meter connected, the current,  $I_m$ , will flow through  $R_p$ . Thus, the voltage drop across  $R_p$  will increase and the plate voltage will be lowered, especially when the resistance of the meter is low in comparison with  $R_p$ . The equivalent circuit with the meter connected is shown in Fig. 8-B, in which  $R_{pi}$  is the internal resistance of the tube which is assumed to be constant with a change in plate voltage. The new plate voltage desired is the voltage across  $R_{pi}$  (or  $R_m$ ) which is

$$E_p = E_b - (I_{pm})(R_p),$$

where  $I_{pm}$  is the new current when  $R_m$  is connected. In other words,  $E_p$  is the difference between the terminal voltage and the voltage drop across  $R_p$ .

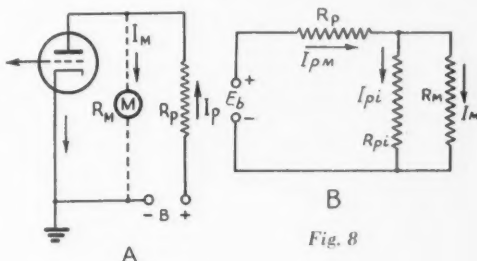


Fig. 8

Example: In Fig. 8,

$$E_b = 250 \text{ volts. } I_{pi} = 0.1 \text{ ma. (0.0001 amp.).}$$

$$R_p = 1 \text{ megohm (1,000,000 ohms)}$$

$$R_m = 1000 \text{ ohms per volt (300-volt scale).}$$

What is the true plate voltage with the meter disconnected and what voltage will be measured by the meter when it is connected?

$$\begin{aligned} E_p &= 250 - (1,000,000) (0.0001) \\ &= 250 - 100 \\ &= 150 \text{ volts} = \text{plate voltage with-} \\ &\text{out meter connected.} \end{aligned}$$

As stated above, when the meter is connected,

$$E_p = E_b - (I_{pm}) (R_p).$$

Since  $I_{pm}$  is not known, its value must be found before the equation can be solved. To find  $I_{pm}$ , the resultant resistance of  $R_m$  and  $R_{pi}$  in parallel must be found, and this, in turn, requires that  $R_{pi}$  be determined. This can be done by considering the circuit before the meter is connected. The total circuit resistance,  $R_t$ , is then given by

$$\begin{aligned} R_t &= \frac{E_b}{I_p} = \frac{250}{0.0001} = 2,500,000 \text{ ohms} \\ &= 2.5 \text{ megohms.} \end{aligned}$$

Also,

$$\begin{aligned} R_t &= R_p + R_{pi} \\ R_{pi} &= R_t - R_p = 2,500,000 - 1,000,000 \\ R_{pi} &= 1,500,000 \text{ ohms} = 1.5 \text{ megohms.} \end{aligned}$$

The resistance of the meter,  $R_m$ , is given as 1000 ohms per volt. Since the meter has a 300-volt scale, its resistance is 300,000 ohms, or 0.3 megohm.

$R_{pim}$ , the resultant resistance of  $R_{pi}$  and  $R_m$  in parallel is given by

$$R_{pim} = \frac{R_{pi} R_m}{R_{pi} + R_m} = \frac{(1.5)(0.3)}{1.5 + 0.3} = 0.25 \text{ megohm.}$$

This gives the total circuit resistance in Fig. 8-B as

$$R_t = R_p + R_{pim} = 1 + 0.25 + 1.25 \text{ megohms.}$$

The new current,  $I_{pm}$ , is then

$$I_{pm} = \frac{E_b}{R_{pim}} = \frac{250}{1,250,000} = 0.2 \text{ ma.}$$

Then,

$$\begin{aligned} E_p &= E_b - (I_{pm}) (R_p) \\ &= 250 - (0.0002) (1,000,000) \\ &= 250 - 200 = 50 \text{ volts} = \text{voltage indi-} \\ &\text{cated by meter reading.} \end{aligned}$$

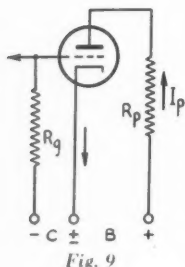


Fig. 9

**Example:** In the case of Fig. 9, it is assumed that the grid is to be fed a square-wave pulse. Compare the plate voltage when the tube is conducting a current of 15 ma. with the effective plate voltage when the tube is idle and not drawing plate current. The plate resistance is 10,000 ohms.

When the tube is conducting,

$$\begin{aligned} E_p &= E_b - I_p R_p = 250 - (0.015) (10,000) \\ &= 250 - 150 = 100 \text{ volts.} \end{aligned}$$

When the tube is not conducting, there is no voltage drop across  $R_p$  and the plate voltage is 250, the same as the supply voltage,  $E_b$ .

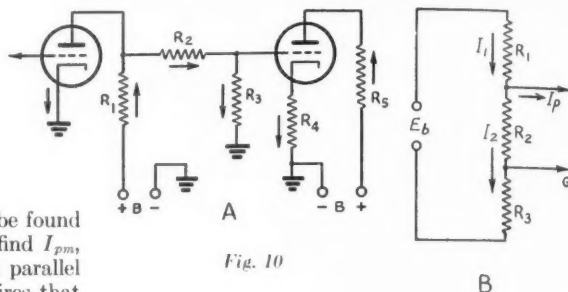


Fig. 10

Fig. 10 illustrates another use for the voltage divider. The coupling circuit shown is that commonly found in direct-coupled amplifiers. From the equivalent circuit of Fig. 10-B, it will be seen that the plate of the first tube is connected at one tap on the voltage divider, while the grid is connected at another tap less positive. It is assumed that the grid of the second tube is biased, by the voltage drop across its cathode resistor, so that the grid does not draw current.

**Example:** In Fig. 10,

$$\begin{aligned} E_b &= 250 \text{ volts. } I_p = 5 \text{ ma. (0.005 amp.)} \\ R_1 &= 10,000 \text{ ohms. } R_2 = 75,000 \text{ ohms} \\ R_3 &= 25,000 \text{ ohms.} \end{aligned}$$

What are the plate voltage of the first tube, and the grid voltage of the second tube?

The total drop across all resistors is, of course, equal to the applied voltage,  $E_b$ . The voltage across  $R_1$  is  $R_1 I_1$ , while that across  $R_2$  and  $R_3$  in series is  $(R_2 + R_3) (I_2)$ , bearing in mind that no current is being drawn from the tap marked  $G$  in Fig. 10-B, so that the same current flows through  $R_2$  and  $R_3$ . Then,

$$E_b = R_1 I_1 + (R_2 + R_3) (I_2)$$

Since both  $I_p$  and  $I_2$  flow through  $R_1$ ,

$$I_1 = I_p + I_2$$

Substituting this value for  $I_1$  in the preceding equation,

$$E_b = (I_p + I_2) (R_1) + (R_2 + R_3) (I_2)$$

Substituting known values,

$$\begin{aligned} 250 &= (0.005 + I_2) (10,000) \\ &\quad + (75,000 + 25,000) (I_2) \\ &= 10,000 I_2 + 50 + 100,000 I_2 \\ 110,000 I_2 &= 200 \\ I_2 &= 0.0018 \text{ amp.} = 1.8 \text{ ma.} \end{aligned}$$

The plate voltage of the first tube is equal to the sum of the voltage drops across  $R_2$  and  $R_3$ .

$$\begin{aligned} E_p &= I_2 (R_2 + R_3) = (0.0018) (100,000) \\ &= 180 \text{ volts.} \end{aligned}$$

The grid voltage of the second tube is equal to the voltage drop across  $R_3$ .

$$E_g = I_2 R_3 = (0.0018) (25,000) = 45 \text{ volts.}$$

# ★ HAMDOM ★

Represented on this page are amateurs in the Army, the Navy and among civilian workers in war production — each playing an essential rôle in winning victory. The three hams pictured here are all serving in vital fields, their performance enhanced by their earlier participation in amateur radio.

Lt. Col. George R. MacEachren, W2DWI, officer in charge at the radio division in the Enlisted Men's School of the Eastern Signal Corps Schools at Ft. Monmouth, N. J., has been a ham for the past fifteen years. Before the war he operated W2DWI from his home in Mamaroneck, N. Y. Admitting that the lure of Long Island Sound on week-ends, in addition to his work as a plant engineer with the New York Bell Telephone Company and various night-school sessions, left him little time for hamming, nevertheless he managed to build his own station and collect a goodly number of QSL cards, many of them from DX stations.



Official U. S. Signal Corps Photograph

But Col. MacEachren's interest in radio goes back many more years than the fifteen he has held his ham ticket. In March, 1918, he enlisted in the Navy as a radio operator and, after training at the Naval school at Cambridge, Mass., served on various ships and land stations until October, 1919. With his discharge papers in one hand and a commercial license in the other he went back to sea as a chief operator until 1921, at which time he "swallowed the anchor" and joined the Bell Telephone Company in New York City. During the birth of broadcasting in the early '20s he "built many strange and mysterious receivers as a sideline — which I somehow managed to sell."

In 1924, still suffering from the operator's itch, he joined the N. Y. National Guard as a communications man. Receiving his commission in 1926, he served as communications officer for the unit until 1931. Realizing that war was drawing ever closer to our shores, he rejoined his old outfit before it was federalized in February, 1941, and, as communications officer, served with it at Ft. Ethan Allen, Vt.; Madison Barracks, N. Y.; and Ft. Bragg, N. C. In March, 1942, he was transferred to the Signal Corps at Ft. Monmouth, at which time he was named administrative officer of the Radio Division. He assumed his present rank and post in February, 1943.

Many hobbies have claimed the interest of Lt. Willard E. Edwards, USNR, W6ATM-ex-W1IE during the past twenty-five years, but of them only two have remained paramount — ham radio and his perpetual calendar (which is described on page 56 of this issue). He devised the calendar in 1919 while attending high school and the same year built and put IIE on the air, operating it continuously until 1928. Three years later he went on the air from California with the call W6ATM.



Radio has been Lt. Edward's career as well as his main hobby and he holds first-class 'phone and telegraph licenses. School vacations were spent as operator aboard ships and after graduating from MIT in 1926 and spending a year with RCA, he returned to seagoing operating for a world cruise. The next two years found him working for the Oklahoma and Colorado AT&T. During this time he received a B.S. in E.E. at the University of Oklahoma and served in the Colorado National Guard, one year as a pilot in an observation squadron. Moving on to California, where he operated W6ATM, he worked as an engineer first at the trans-pacific radiotelephone station at Dixon, then at KFI-KECA, Los Angeles, and later at Lockheed Aircraft. In 1941 he took a position as engineer at the Navy Yard in Hawaii. Incidentally, he was at Pearl Harbor on Dec. 7th doing emergency communications work.

Commissioned a Lt. C-V(S), USNR, in February, 1942, he has since been doing air and surface duty.

Winner of two awards in the past year from his employer, the General Electric Co. for suggestions to speed up the production of radio crystals, Anthony Conti, W2BVR-ex-W1KTN, joined GE's Crystal Department in 1941. Now he supervises the cutting and lapping operations in the department. His first award was for a method of making corrections of angles; his second award, which included a check for \$100, was for a device to control lapping machines so that the speed of the machines could be increased or decreased gradually, preventing chipping and fracture of the blanks.

Preceding W2BVR's interest in radio was his love of music. While in charge of the orchestra aboard the steamer *Evangeline* of the Eastern Steamship Lines, traveling between New York City and Yarmouth, N. S., he was bitten by the bug and found that most of his spare time was spent in the radio room. He dropped anchor in Boston long enough to graduate from Mass.

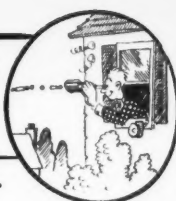
Radio School, receiving his amateur ticket as well as a radiotelegraph second-class license in 1932.

Maine claimed him next and, operating W1KTN, he was very active in AARS and ORS on 40 and 80 meters. On moving to Schenectady in 1941 he operated W2BVR until Pearl Harbor called a halt to all hamming.





## EXPERIMENTER'S SECTION



Address correspondence and reports to ARRL, West Hartford, Conn.

### PROJECT A

### Carrier Current

THE c.c. gang may be interested in a few notes made during a visit to a commercial carrier-current installation, and also in a diagram of the coupling system used with portable units.

The transmitter is a master oscillator and power amplifier, with an input of about 8 watts to the final stage. It has a consistent range in excess of 70 miles. It should be remembered, however, that in this service 38,000-volt lines are employed, and conditions on such lines are very different from those usually encountered by amateurs using the 115- or 230-volt lines.

The receiver is a simple plate detector with one stage of audio.

Portable units used in connection with this installation are actually transceivers. In the transmitting position a single triode operates as a grid-modulated Hartley oscillator. In the receiving position the same tube operates as a grid-leak detector. The plate voltage applied is 135 when receiving; this is increased to 180 volts for transmitting. The range of these units is about 50 miles over the 38,000-volt lines.

Fig. 1 shows the coupling system used with the portable units. A standard coupling capacitance of 0.001  $\mu$ fd. per phase is used in portable and fixed units alike.

In the instruction manuals accompanying this commercial equipment, stress is laid on the importance of making a survey of signal strengths over the entire frequency range available. Checks are made at intervals of 5 kc. or less and points logged in frequency against signal strength. A graph is then plotted through the points. The instructions caution the operator not to choose a point where a sudden sharp rise and fall of signal strength appears, since such points would not be at all stable under changing line conditions.

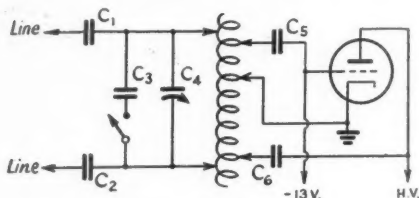


Fig. 1 — Diagram of coupling system used in portable commercial carrier-current units.

C<sub>1</sub>, C<sub>2</sub> — 0.001  $\mu$ fd. C<sub>4</sub> — 0.0005  $\mu$ fd.  
C<sub>3</sub> — 0.00025  $\mu$ fd. C<sub>5</sub>, C<sub>6</sub> — 0.004  $\mu$ fd.

This would be true in even greater degree of the conditions met by amateur c.c. operators. — Cpl. Richard J. Sauer, ASN 35866918, APO 845, c/o PM, Miami, Fla.

We have now been working on wired wireless for several months. Our network has three transmitters, operating at present on 270 kc. One of the transmitters has 75 watts input to a pair of plate-modulated 809s; the other two transmitters are of lower power.

Transmissions are on 'phone, c.w. and m.c.w. Code-practice transmissions are made on 270 kc. each Saturday and Sunday evening between 7:00 and 7:45 P.M.

We also have been doing some experimental work with narrow-band f.m., hoping to cut down the effect of line noise by using the f.m. carrier.

We are trying to establish a network which will include the west side of Cleveland as well as Parma and vicinity. We would like to contact anyone in the Cleveland area who is interested in c.c. Our telephone number is FLorida 2953. Anyone interested in seeing the station is invited to come over and get acquainted. — Alex Panzer and B. I. Florey, WW8XCC, 5760 West 45th St., Parma 9, Ohio.

Here at the "Campus Studios" of the University of Washington we are experimenting with carrier current. At present we are building a 50-watt unit with a pair of 807s in the final stage.

Our problem is to cover the extensive area of our campus with a system such that standard b.c. receivers will not have to be rebuilt for reception of the c.c. signals.

I would like to contact any c.c. fans in Seattle who are now active. — Thomas Bean, 7031 51st Ave., N. E., telephone VE. 5032.

EDITOR'S NOTE. — The c.c. system installed at Williams College and described by Alvin Eurich, W7HFZ, on page 39 of QST for May, 1942, is the best we know for meeting the requirements outlined by Mr. Bean. In this system a complete r.f. unit is installed at the studio. Its output is wired to the various buildings and fed into a Class-A r.f. amplifier in each building served. The amplifier is coupled to the pipes of the heating system.

There are several amateurs working with c.c. in Bridgewater, Mass. We have been very successful in all QSOs in the three-way net now operating. More fellows are getting ready to join.

The frequency used is 170 kc. as checked by a wavemeter. The maximum distance covered so

far is 6 wire miles, with R9 signals on both 'phone and c.w.

As an experiment, one evening we all dropped the plate voltage to 45 volts. We were amazed to find that the signals remained at the R9 level. The signal strengths have been so great that no difficulty has been experienced with line noise.

We are very anxious to organize a wider network with stations in adjoining Brockton, Taunton, the Eastons, Bridgewater, etc. If interested, please contact one of us. — *Kenneth Lang, WWKL, Edward Johnston, WWEJ, Alex Bagicidis, WWAL, Bridgewater, Mass.*

— . . . . —

We have just completed two c.c. rigs and are meeting quite a few problems and peculiarities.

We have established two-way communication over 10.4 miles with a signal strength of R4 over the lines of one power company, and one-way communication with an R4 signal over the lines of another at a distance of 10.9 miles.

We have noticed that some frequencies carry better than others, and that during certain hours of the day the signals are better than at other times.

Our receivers are working fairly well and we have heard several fellows whom we have not been able to contact as yet.

We will be glad to hear from any fellows who are working on c.c. and especially any who may have suggestions or problems to discuss. — *Ray Ellis, 5 Smyth St., Belton, S. C.*

— . . . . —

I would like to know of anyone in my vicinity interested in 100-ke. operation over power lines. — *Carl Hart, Wyomissing, Pa.*

## Pre-Radio

BY SIMPSON SASSERATH, SIC,\* USNR

WHEN I was in boot training I met a specialist C.

Who whispered that Pre-Radio was just the thing for me.

I listened to that sexless wave, that smooth GI Iago.

I took a test, I took a train — and now I'm in Chicago

With a pencil in my pocket, a slide-rule in my hand,

And notebook full of formulas I do not understand.

*Oh, for the life of a gunner! Oh, for the life of a cook! They do their jobs, those lucky gobs, and never open a book!*

It's algebra each morning and it's algebra each noon,

And homework every night until my head's a big balloon.

\*Box 4259 Duke Station, Durham, N. C.

While always in my shaky hands I hold my little slipstick

The way an aging chorus girl would clutch her rouge and lipstick.

With fractions, roots and decimals I'm trained to fight the Japs

And I wrestle with equations from reveille till taps.

*Oh, for the life of a striker, who sails o'er the bounding sea —*

*Not giving a damn about any exam, his mind is clear and free.*

A man named Ohm once wrote a law to solve for any circuit.

They know it's true; I know it's true — and still they make me work it.

They give me wiring diagrams that cross in all directions,

And then I go into the lab and make the right connections.

Resistor board . . . resistor board . . . give me your answer true.

Oh milliamp, you little vamp, my future rests with you.

*Oh, to be a lieutenant — I'd settle for Junior Grade —*

*His only care to comb his hair and polish up his braid.*

George Washington received applause crossing the Delaware,

And Hannibal, who crossed the Alps, gave Ancient Rome a scare.

J. Caesar crossed the Rubicon to make Pompey a bum —

But all I get is zero when I cross the Vinculum.

Those poundings in my temples do not come from colds or sinus;

They're memories of powers of ten I didn't change to minus.

*Oh, to be a Coast Guard — or else a gallant Marine —*

*Who need not pain to make his brain into an adding machine.*

May Heaven please forgive me, that I've hurled such dirty names

At Volta and at Ampere and at Mrs. Watts' boy James.

I've passed my comprehensives and my sleeve has one more stripe.

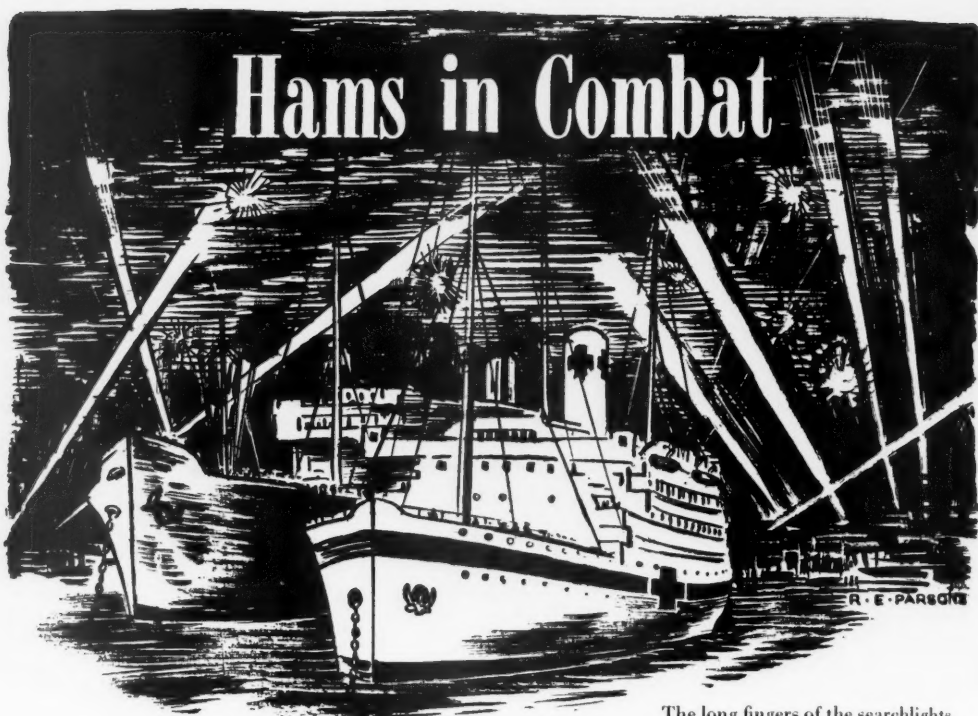
Do you think my woes are over, that I've no further gripe?

Well, now in recognition of my industry and ardor

They're sending me to Primary — and that is even harder!

*Oh, for the life of WAC or SPAR! Oh, for the life of a WAVE!*

*They wear white roses; they powder their noses, and never study or shave.*



# Hams in Combat

The long fingers of the searchlights probed the sky for enemy planes.

## A Lady of Mercy

BY S/SGT. JOHN F. WOJTKIEWICZ,\*  
W36JY-W46QJ

**T**HE *Lady Luck* was converted from a troop ship to a hospital ship in the record time of twenty-one days. Reconstructing the partitions, discarding armor plate and gun emplacements and installing the precision equipment necessary for a complete hospital is no mean task, especially in the limited time of three weeks. We made our trial run on the 16th of June. On June 21st we left New York and headed for the war zone. The weather was unbelievably perfect and the sea was smooth as glass all the way across.

We arrived at "Dandelion" on July 1st. One is suddenly aware of the war in Dandelion. The heavily fortified area is the supreme ruler of the Mediterranean. No ship, large or small, can traffic that sea without clearance from the area. Airplanes maintain constant vigilance above it. Searchlights range the skies about it all night through. Ships are given instructions by blinker and small patrol boats bristling with guns move constantly about, making sure everything is as it should be. The tremendous concussion of depth charges keeps you constantly aware of the submarine threat. Dandelion is off the shore of Violet, and you hear the occasional zing of high-powered rifles and the splash of bullets in the near-by waters. You never know, with so many Germans in Violet, whether they are sniping at you or just keeping in practice.

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After dark the ships near shore in Dandelion have to keep a constant guard against Axis sympathizers, who have a cute trick of swimming out to a ship and tying a time bomb on it. Any swimmers spotted near a ship at night are fired on first and then asked what they are doing. Too many accidents have happened to Allied ships in the waters around Violet. . . .

We spent a week in the harbor at Dandelion. The natives rowed out to the *Lady Luck* with their families in the picturesque little Violet boats. They had a kind of wine (they called it cognac) which they wanted to trade for American cigarettes. The deal was one carton for two bottles. This seemed fair enough until we learned that they sold the cigarettes for fifty cents a package in the neighboring towns. At that exchange they were selling us the wine for \$2.50 a pint.

Nevertheless, the people of Violet did a land-office business. They would toss a piece of cork aboard with a long cord attached. On the other end of the cord was a small basket. You would tell them how many bottles you wanted and they would fill the basket accordingly. You would then hoist the basket aboard and send the cigarettes down when you lowered it. The captain warned against drinking the wine, saying that no one, probably not even the people of Violet, knew what it was made from. When the warnings didn't stop the traffic, the skipper took more effective measures. Whenever the "bumboats" (as they were called) came within reach the fire hose was turned on them — and, believe me, the *Lady Luck* has quite a fire hose! After a few of the bumboats were swamped no more wine came aboard.

Soon we received orders to proceed to Ecstasy, arriving there July 10th. Ecstasy looks like a page from a child's story book. Built in a semicircle around a protected bay, it extends skyward in tiers. Beautiful minarets rise here and there above the picturesque houses, and the bright colors on the roof tops are set off by the clear cobalt of the Mediterranean.

But the excitement aboard our ship on the 10th of July had nothing to do with our arrival in Ecstasy. We learned of the invasion of Sicily just as we dropped anchor. At last it had come! Hurried preparations were begun for receiving the wounded, for it would be but a question of time before we would be called into action.

A few hours later we had new sailing orders. Next morning we awakened to see the French naval base in Olive — or, more correctly, what was left of it. Everywhere there was nothing but rubble and ruin. I had heard of a city being bombed to ruins, but until you see it you can't conceive what total destruction means.

Later that day I made a tour of Olive in a jeep. Not a single building was left in its original state. Some of the destruction, I later learned, had been caused just three days before, when a hundred German bombers had come over to pay their respects to their American conquerors. But most of the destruction had been caused by the Americans. While it was a miserable sight to behold it was, at the same time, a tribute to American bombing and artillery accuracy.

As the *Lady Luck* threaded her way through the maze of sunken vessels I wondered how we were going to squeeze through. Sunken ships by the dozen lined either side of the narrow channel we had to navigate and they were at such an angle that steering a straight course was impossible. When a ship the size of the *Lady Luck* turns sharply one way or the other, her stern will swing accordingly. The skipper cut one side of a sunken hull as close as possible, swung the ship hard over to starboard and then hard over to port, making a figure "S." We made it with a bit to spare, but another hospital ship coming in later didn't. She jammed up both propellers.

We had no sooner docked than ambulances began unloading the wounded and our hospital crew quickly carried them aboard. I learned a great deal that day as our stretcher bearers and nurses tended the wounded. I saw what a gentle feminine touch on a fevered brow or a pleasant, reassuring word from a doctor can do for a man in pain.

In an amazingly short time our ship was loaded and on its way to a base hospital in Clover. Once under way the nurses passed out candy bars, Coca Cola, cigarettes, magazines, shaving cream, tooth paste and other every-day items that suddenly had become forgotten delicacies in a war-ravaged country. Morale among these wounded men was high. With the mental cases it

### U. S. War Bonds for Stories of War Service

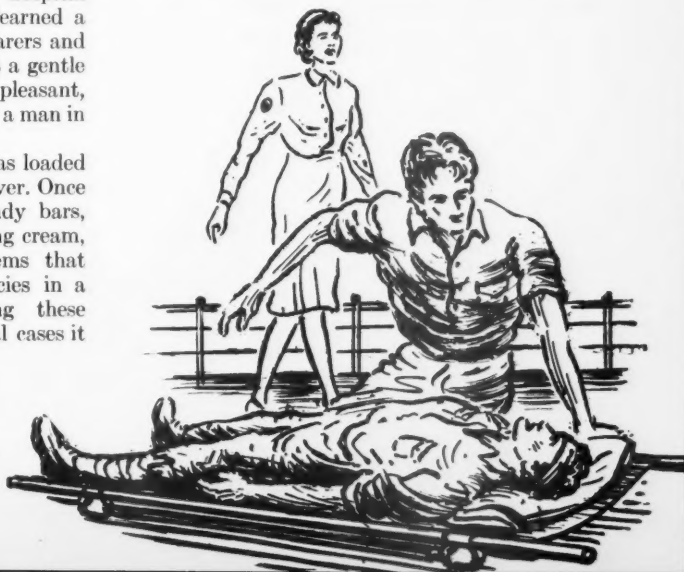
*QST* wants reports on the experiences of radio hams in active service on the battlefronts — for immediate publication in this section, where feasible, or to be held confidential where security considerations so require.

Do you have a story of war service to tell — either your own or that of someone you know? Then write us a letter giving full details, including photographs, clippings and other substantiating data where available. If your story is published in *QST*, you will receive a \$25 U. S. War Bond. Please indicate clearly on the report if it is available for publication in its entirety, if names, dates or places should be deleted, or if all information must be held confidential.

was different. One officer in particular caught my attention. He was a clean-cut fellow in his middle twenties. There was no shell shock in his case — just plain horror. He had seen too much of war.

Clover, city of romance and intrigue, flowed with colorful costumes of the Arab tribesmen, the white robes of the veiled Moslem women and the red, white and blue uniforms of the French Senegalese soldiers. I had been told not to "gawk" at the Moslem women, for their men take exception to the slightest "crudity" and will slit an infidel's throat with relish. However, Moslem women's purity in my mind is slightly questionable, for one of them tried to pick my pocket!

We had but one day in Clover, for the next day we received sailing orders. The *Lady Luck* nosed her way out of the harbor. There was much speculation as to where we might go, but the only one who knew was the captain and he wasn't saying. Then, as I made my way to the bridge to report for duty, the news came out. We were going to Lilac — and, to top it off, we were going directly to the invasion point of Rose. At last we were going to see some real action! In no time the whole ship knew of it. Suddenly the nurses voices



Ambulances began unloading the wounded and our hospital crew carried them aboard.

June 1944

pitched a bit higher. Conversations ran on endlessly, each of us wondering how we would react to a bombing, what we'd do if the ship sank, what to look out for in a shell burst.

We had been out but a short while when the captain announced that from then on we would wear our Mae Wests at all times. We looked at each other knowingly. "Oh, oh — it was coming." What the captain knew and we didn't was that a British hospital ship had just been sunk by enemy bombs.

It's a helpless feeling out there on the sea at night — a perfect target, all lighted up. You're entirely on your own if the enemy takes a shot at you, for you have no escort vessels to help out and no guns with which to defend yourself.

Next morning the ship's whistle shrieked seven short blasts and one long one, meaning: "Take to the life boats." Sudden calm shrouded the ship. Everyone made his way to his life-boat position as quickly as possible, and I turned in to the radio shack. There had been no bombs, no torpedoes, no planes — but maybe the skipper knew what was up. Everything was in perfect order; there was no panic or scramble. Only after we were all set and the others were in the lifeboats did we learn that it was only a drill.

The morning of July 16th found us in Rose. At first glance the city looked to be undamaged, but when we went ashore the telltale marks of machine gun and rifle fire were very much in evidence.

As we walked inland the quiet quickly ended. An artillery duel started up a few miles away, and the earth quaking beneath our feet told us that the guns were anything but small fry. As we moved about the littered streets a sergeant casually mentioned that we had better not walk where we were, adding that there were land mines almost under our feet. I froze in my tracks — we were right in the midst of the mines and any one of them would have blown us to pieces. He also warned us not to touch any of the captured equipment, as most of it had been carefully wired to booby traps. Very suddenly I felt as though I were all hands and feet, and I'm sure I have never been so clumsy in my entire life. Yet the villagers and even small children were making their way around the mines and booby traps as though they didn't exist.

Not far away a wounded soldier was having trouble. He had a broken leg and he was in obvious pain. As we came closer to him we saw a peasant lying on the ground with a bullet hole in his head. Quite simply the soldier informed us that the peasant had been taking him back to a first-aid station when a German sniper let him have it. The

soldier asked us to help him onto the back of a burro standing near by. We did, and he went on his way.

The artillery barrage was thicker now. We met some of our officers and they told us to get back to the ship; they expected Rose soon would be in for a bombing. We were to proceed to Grapevine. One doesn't think twice about orders like that. Away we went to the *Lady Luck*, loaded with souvenirs.

When we got back our CO was nowhere to be found. He had gone to the front lines to have a look at the fighting. What to do? Sailing orders and no commanding officer. . . . The skipper gave orders that we would sail without the CO, and that we would pick him up in Grapevine.

For two days we shuttled back and forth between Grapevine, Rose and Corsage, picking up the wounded. True to expectation, Rose was bombed. One of the ships in the harbor of Rose was hit and torn to ribbons, but no bombs came within hundreds of yards of us.

On the night of July 17th I first saw a bomber go down in flames. Antiaircraft fire hit the plane as it was diving, and it caught on fire. Leaving a trail of bright orange, it hurtled toward the earth. At perhaps fifteen hundred feet its bomb load exploded and the ship suddenly burst into what seemed a thousand pieces.

The night of July 18th found the *Lady Luck* loaded with wounded and on her way back to Clover. The smell of flesh and antiseptic was stifling below. The full horror of war comes upon you when you see the after-effects of a battle. If more people could see what we on the *Lady Luck* saw. . . .

On the morning of July 22nd it was officially announced that Palermo had fallen. Everyone was amazed, for there had been no indication that the American Seventh Army was even close to capturing the city. Exuberance fairly drooled from those aboard the *Lady Luck*. Not only had the Americans scored a surprisingly quick victory, but it meant that we would very soon see action again. However, day after day went by with not a sign of a sailing order. Finally, on August 5th, the *Lady Luck* again pointed her bow toward Rose and this time Carnation.

My watch was over at midnight and I went below to get some sleep. At 0330 one of the mates awakened me to see the air raid over Carnation. The antiaircraft fire was beautiful against the blackness of the sky. Varicolored tracer bullets spouted from the 20-mm. guns, and the smaller-caliber machine guns added to the rainbow effect when the planes swooped low enough for machine-gun fire to be effective. Star shells and pom-poms from the British Navy were in evidence, and the enemy planes suddenly changed their tactics to high-altitude bombing. However, the U. S. Army pilots based just outside of Carnation decided the Jerries had had their fun, and within a few moments all the enemy planes were either knocked out or chased home.

Most interesting of the sights in Carnation was the fortification of the hills surrounding the city.



I saw a bomber go down in flames.

I have seen pill boxes before, but never like these. They are absolutely immune to the biggest of our guns. On close inspection I saw why — the concrete walls are eighteen feet thick and are heavily reinforced with steel girders. How, then, did the Americans dislodge the enemy from these strongholds? I asked a soldier who had participated in this action, and he informed me that our men had to crawl up the sloping steel walls under cover of darkness and toss hand grenades through the tiny slits of the pill boxes. You can imagine how many of our men lost their lives before this mission was accomplished. I couldn't help but recall the headlines — "Carnation taken with surprisingly few Allied casualties" — when I heard this soldier's tale. It all sounds so easy in the headlines. . . .

We loaded the wounded from the base hospitals in Carnation aboard the *Lady Luck*. As each wounded man came aboard he was asked the name of his home town. No matter where the man was from he always heard a voice call out: "I'm from there, too, buddy. Welcome home!" The effect on the wounded man was always the same. A smile would wreath his face and the strain and newness of the hospital ship was broken. I've always suspected those men of the *Lady Luck* had never even seen the home towns of the wounded men, much less having come from there. It was just a thoughtful gesture of sympathy for a fighting buddy.

We returned to Violet in the late afternoon of the 6th. Again the *Lady Luck* threaded her way through the maze of sunken ships in the narrow channel. Violet had changed even in the few days we had been away. Everywhere the debris had been cleared away, and one could now go through the streets without walking around piles of steel, brick and plaster that had once been buildings.

That night we were docked only ten yards from a big Liberty ship loaded with blockbusters and smokeless powder. Undoubtedly it was the most unpopular ship in the world for a dockmate, especially in Violet where air raids are far from uncommon. Those aboard the Liberty ship informed us that if a bomb should hit their cargo it would destroy every living thing within a radius of one mile — and we were ten yards from it!

At 0330 in the morning anti-aircraft guns practically blew me out of bed. Half asleep, I staggered out on the deck to see a Coney Island of gunfire. The enemy planes had already dropped flares and the whole surrounding area was alight, the brightest area being directly over the Liberty ship. The long fingers of the searchlights were probing the skies for enemy planes, but the raid-



Leaving a trail of bright orange, the flaming bomber hurtled toward the earth.

ers somehow managed to keep out of sight. Suddenly one light picked up a raider and instantly a dozen searchlights had him in their beams. All hell broke loose as the guns from ships and shore turned on him. More flares fell as the raider circled and climbed out of range of the guns. Suddenly the searchlights picked up another raider, and then another.

At a time like that, with all the noise and brilliance of dozens of guns firing, the world seems to stand still. Action could be seconds or minutes long; one can never be sure afterward. The flares were settling earthward now and the area was bright as day. I looked over at that Liberty ship and remembered those unpleasant words: "If we should be hit, there would be no living thing within a radius of one square mile." All about me the crew discussed the effects of the different guns, what the pilots of the raiders must be thinking up above, how many pieces we would be in if the Liberty ship were hit.

I saw a raider diving at us — straight for the Liberty ship. I wondered if the enemy knew what was in that cargo. The way the flares were dropped I was sure they did. I saw bomb after bomb drop harmlessly to earth hundreds of yards from any objective, but no man could have bombed accurately through the hell our guns were throwing up.

Later I learned there were fifteen raiders at a higher level, waiting for an opportunity to get through an opening in the defensive gunfire. But that opening never came, for the anti-aircraft fire made such a terrific umbrella of death that it would have been sheer suicide to have tried to dive through it.

The raid was over at 0445 and four raiders had been shot down. In fifty-five minutes of diving, bombing and strafing there was not a single Allied casualty.

(To be continued)

# A Beginner's Station

*Simple and Inexpensive Homemade Equipment for the Would-Be Ham*

BY BENJAMIN L. TOY\*

On the principle that it takes a beginner to appreciate a beginner's problems, this article should be of notable interest to the post-Pearl Harbor hams now struggling to assemble (or at least to plan) their first station against the day when the green light is flashed. The author has approached and solved the typical beginner's problems in authentic style, skirting priorities and devising economical, trouble-free designs for each essential station component.

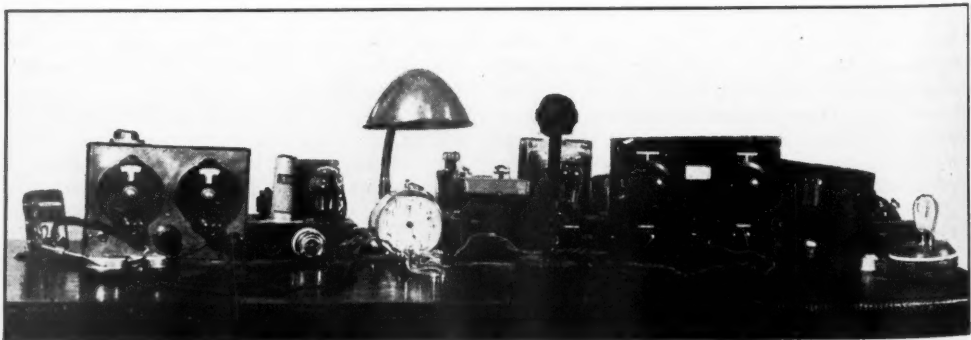
THE neophyte generally is at a complete loss when the time comes to decide what equipment he shall use in his first station. With his limited scope of knowledge, he has difficulty devising a layout which will meet his ideas of good performance and yet which will cope with the restrictions imposed by inexpensive construction.

To satisfy the beginner, the apparatus must fit seven principal requirements. First, it should offer no constructional difficulties. The beginner wishes to avoid the difficulties of fitting cumbersome parts into place and groping his way through a maze of wiring. Second, the operation and adjustment of the station equipment should be as simple as possible. All frequently used controls should be readily accessible and easily set for optimum performance. Third, the receiver should have a fair degree of sensitivity and selectivity. It will not be expected to perform like an HRO, but it should be reliable and consistent in operation. Fourth, the transmitter should have provision for 'phone or c.w. output and instant selection between the two. Fifth, the transmitter should furnish enough output to assure reason-

ably consistent communication under most conditions, although it need not be a high-frequency power house. Sixth, the station should be compact. There should be no necessity for calling in a horde of "muscle men" when the operator wishes to move the apparatus from one locale to another. Seventh and last, the cost of the set-up should not be excessive. In these days the problems of priorities on materials must be added.

All of these points were considered in the construction of the beginner's station shown in the photographs. The equipment includes a receiver and a transmitter, with separate power-supply units for each, a plate modulator for the r.f. section, and an antenna tuner. All of the units are small and easily separated for transportation. The entire station weighs less than twenty-five pounds. Since most of the components were excavated from the traditional junk box, the cost of parts for the whole assembly amounted to about two dollars. This leaves but the price of the black paint, two or three tubes and some solder to be considered. In the light of a possible cash outlay of about fifty dollars had all new parts been used, this is indeed a minor expenditure.

With the exception of the steel panel used for the receiver, all of the units are built on wood. The chassis are fashioned from  $\frac{3}{8}$ -inch soft-pine stock and the panel for the transmitter is of  $\frac{1}{4}$ -inch stock, to facilitate mounting the controls. When the wood has been sanded down and given a coat or two of black enamel the appearance is not at all displeasing to the eye. Most of the parts used once helped to bring in broadcast programs in the early '30s. The meter switch was formerly part of a phonograph attachment, while the receiver panel was at one time a chassis bottom plate. The National dials came from an early battery set which also supplied the midget variables. These were once 140- $\mu$ fd. antenna trim-



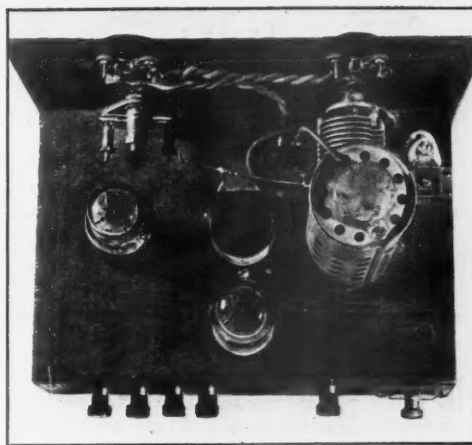
The various units of equipment for the beginner's station, combined in a convenient station layout. Left to right: Receiver power supply, modulator, transmitter power supply, transmitter, antenna tuner, and lamp dummy load.

mers. One was stripped down and used as a bandspread condenser. All coils, except for the one in the antenna coupler, were wound on tube bases for the simple reason that no commercial forms were obtainable. Since no easily tapped coil was available for the antenna tuner, one was air-wound for the purpose.

Tubes of the type commonly used in prewar low-power transmitters, such as the popular 6L6s and 807s, are now not obtainable for ham use. In fact, almost any of the 6.3-volt series of receiving types which might serve in a receiver and as acceptable substitutes in the transmitter are not easy to pick from the dealer's shelf these days. On the other hand, because there is comparatively little demand for them at the present time, most dealers usually have several types in the 2.5-volt series in stock. Both 47s and 27s seem to be quite plentiful, and so both the transmitter and receiver were designed around these types. The 47 in the final amplifier of the transmitter furnishes an output of 10 watts on c.w. and 6 watts on 'phone.

### The Receiver

As shown in the circuit diagram of Fig. 1, the receiver consists of a regenerative detector followed by two stages of resistance-coupled audio amplification. The antenna-coupling, bandspread and feed-back arrangements shown were used for reasons of simplicity.  $C_1$  is the padder, which may be set for any particular amateur band, while  $C_2$  is the bandspread condenser. Its dial is the main tuning control. Regeneration is controlled by



A plan view of the receiver, showing the location of the tubes and terminals. The coil is in the center above the first audio amplifier tube, with the antenna trimmer at the upper right. The small variable condenser at the left is the bandspread condenser, while the larger one to the right is the band-set padder. On the rear edge of the chassis are mounted the power and antenna terminals.

varying the screen voltage by adjustment of  $R_2$ . The plate tickler coil,  $L_2$ , may be trimmed without disturbing the grid winding. Coil dimensions will be found in Table I.

The decoupling network in the detector plate circuit, consisting of  $R_3$ ,  $C_8$  and  $R_5$ , proved useful in reducing hum and improving stability. The capacity indicated for  $C_8$  was sufficient, although a larger value might be somewhat better.

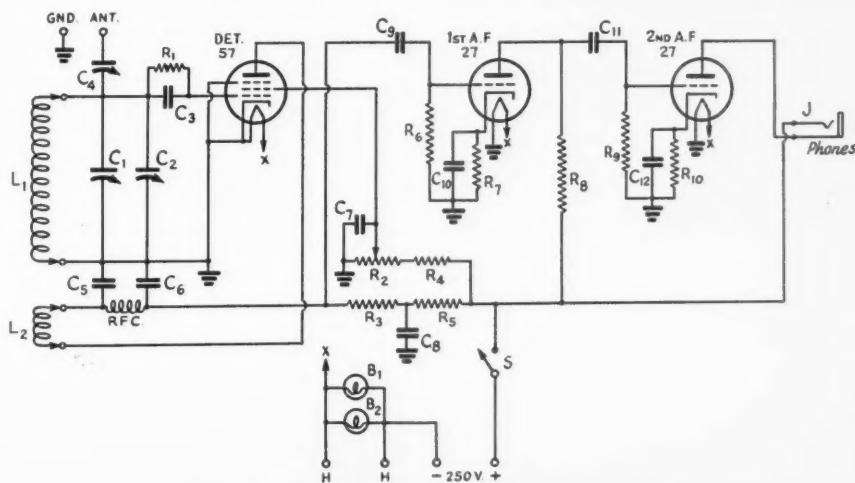


Fig. 1—Circuit diagram of the regenerative receiver.

- $C_1$ —140- $\mu$ fd. midget variable band-set condenser.
- $C_2$ —15- $\mu$ fd. midget variable bandspread condenser.
- $C_3$ —100- $\mu$ fd. midget mica grid condenser.
- $C_4$ —3-30- $\mu$ fd. midget mica antenna trimmer.
- $C_5$ —250- $\mu$ fd. midget mica condenser.
- $C_6$ —500- $\mu$ fd. midget mica condenser.

- $C_7$ ,  $C_{12}$ —1.0- $\mu$ fd. paper condenser.
- $C_8$ —0.5- $\mu$ fd. 400-volt paper decoupling condenser.
- $C_9$ ,  $C_{11}$ —0.05- $\mu$ fd. paper condenser.
- $C_{10}$ —0.1- $\mu$ fd. paper condenser.
- $R_1$ —5 megohms,  $\frac{1}{2}$ -watt carbon.
- $R_2$ —50,000-ohm wire-wound potentiometer (regeneration control).
- $R_3$ —0.1 megohm, 1-watt carbon.
- $R_4$ ,  $R_5$ —50,000 ohms, 1-watt carbon.

- $R_6$ ,  $R_9$ —0.5 megohm,  $\frac{1}{2}$ -watt carbon.
- $R_7$ ,  $R_{10}$ —1500 ohms, 1-watt wire-wound.
- $R_8$ —0.15 megohms, 1-watt carbon.
- $L_1$ ,  $L_2$ —See Table I.
- $J$ —Open-circuit headphone jack (see text).
- $S$ —S.p.s.t. toggle stand-by switch.
- $B_1$ ,  $B_2$ —2.5-volt pilot-light bulbs for illuminators on the National dials.

**TABLE I**  
**Receiver Coil Data**

Band	L <sub>1</sub> (Grid)	L <sub>2</sub> (Feed-back)
1.75 Mc. . . 40 turns close-wound		6 turns close-wound
3.5 Mc. . . 22 " " "		4 " " "
7 Mc. . . 10 " " "	spaced to 1/8 inch	6 " " "
14 Mc. . . 7 " " " "	" " " "	5 " " "
28 Mc. . . 3 " " " "	" " " "	5 " " "

The 1.75-Mc. coil is wound with No. 28 enameled wire; all others with No. 22 s.c.c. wire. L<sub>2</sub> is spaced 1/8 inch from ground end of L<sub>1</sub>, and wound in same direction. All coils are wound on UX 4-prong bakelite tube bases, 1 inch high and 1 1/4 inches in diameter.

The receiver chassis is 3 × 6 × 9 1/4 inches in size. It is made with an open front to provide for the panel, which is fastened to the edges of the chassis by means of three wood screws. The panel, cut down to dimensions of 7 × 9 1/2 inches from an old 1/16-inch steel bottom plate, is drilled and reamed to fit the controls.

The arrangement of parts may be seen in the rear-view photograph. There is but one unusual

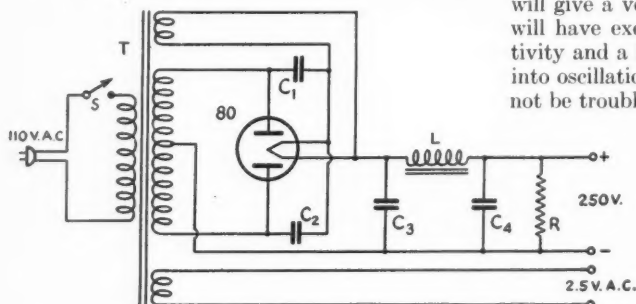


Fig. 2 — Circuit diagram of the receiver power supply. C<sub>1</sub>, C<sub>2</sub> — 0.001-μfd. 1000-volt mica condenser (see text). C<sub>3</sub>, C<sub>4</sub> — Dual 8-μfd. 450-volt electrolytic condenser (C-D EB-8800).

R — 100,000-ohm 10-watt wire-wound bleeder resistor. L — Replacement-type filter choke, 10-hy. at 40 ma.

T — Replacement-type power transformer: 300-0-300 volts at 40 ma.; 4 volts at 3 amperes; 2.5 volts at 5 amperes.

S — S.p.s.t. toggle switch.

point about the wiring. This is the connection of the headphone jack. As may be seen in the schematic, the customary arrangement has been reversed. The plate potential appears on the exposed portion of the jack only when the headphones are plugged in. This prevents an accidental contact—which might disturb the operator's train of thought, since there is about 250 volts between the panel and the jack!

Power for the receiver is furnished by the supply diagrammed in Fig. 2. The dual filter condenser, C<sub>3</sub>C<sub>4</sub>, supplies ample filtering action to afford freedom from hum, that scourge of regenerative receivers. In fact, more hum is picked

Rear view of the transmitter with its crystal socket in the rear right-hand corner. The oscillator tube is to the left of the crystal, and the oscillator coil is at the center of the chassis. The rear section of the dual condenser at the right is the oscillator plate tank condenser. The r.f. amplifier components are grouped at the left. Power and output-link terminals are on the rear edge.

up at the detector-grid terminal from house-wiring fields than passes through the power-supply filter. Tunable hum occurring at certain points in the tuning range was eliminated by adding the mica condensers, C<sub>1</sub> and C<sub>2</sub>, shunting the rectifier tube.

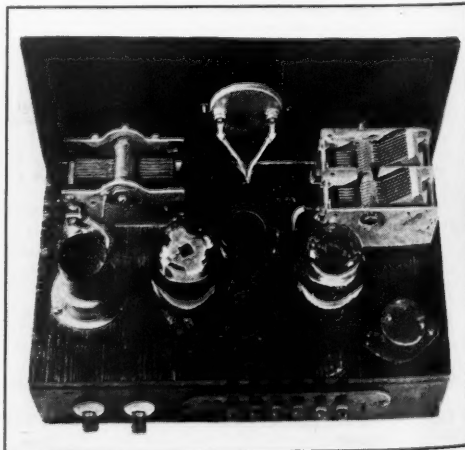
The receiver power supply is mounted on a smaller chassis. The dimensions of this base are 2 1/2 × 5 1/2 × 7 inches. Binding posts are provided at the rear for output connections. In addition, there is a four-prong socket on the front so that a cable-and-plug system may be used if desired, although this latter provision is not strictly necessary. The output voltage is between 250 and 275 volts.

The receiver will be found easy to use after a little experience is gained, but a few points may be worth mentioning. Adjustment of the antenna trimmer will be found to have a very definite effect upon regeneration. If the coupling is not adjusted correctly, instability, fringe howl and generally poor performance may result. When the correct adjustment has been reached the receiver will give a very satisfactory account of itself. It will have excellent sensitivity, reasonable selectivity and a low hum level. The detector will go into oscillation smoothly, and body capacity will not be troublesome below 10 Mc.

This receiver should work right up to about 50 Mc. with the highest-frequency coil, although body-capacity effects may be noticeable at the very-high frequencies. With careful adjustment, f.m. stations in the 40- to 50-Mc. range have been received quite regularly. While the coils were wound for the ham bands, they are good for general coverage as well. The approximate ranges are: 1.5 to 2.2 Mc., 3 to 5 Mc., 6 to 12 Mc., 10 to 17 Mc. and 26 to 50 Mc.

### The Transmitter

The transmitter is simplicity itself. Consisting of a two-stage oscillator-amplifier circuit, as shown in Fig. 3, it is easy to build and put into



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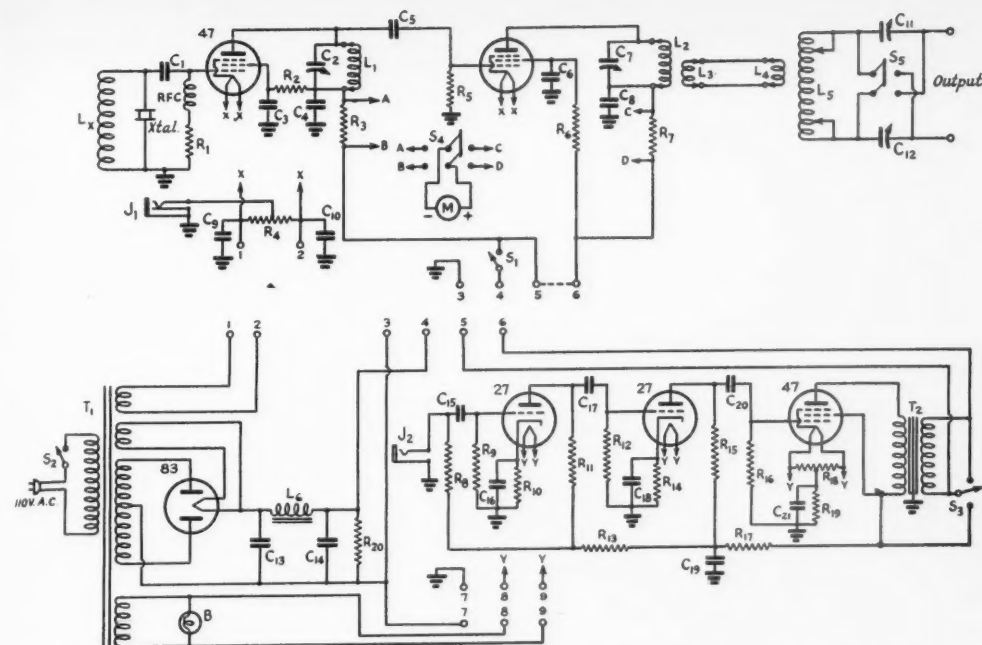


Fig. 3 — Circuit diagram of the transmitter, antenna tuner, modulator and transmitter power supply.

- |  |   |   |
|--|---|---|
| C <sub>1</sub> — 0.0005- $\mu$ fd. mica.   | R <sub>3</sub> , R <sub>7</sub> — 50 ohms, 1-watt carbon.                         | J <sub>1</sub> — Closed-circuit keying jack.  |
| C <sub>2</sub> , C <sub>7</sub> , C <sub>11</sub> , C <sub>12</sub> — 365- $\mu$ fd. variable. | R <sub>4</sub> , R <sub>18</sub> — 75 ohms center-tapped, 5-watt wire-wound.      | J <sub>2</sub> — Open-circuit microphone jack.  |
| C <sub>3</sub> — 0.03- $\mu$ fd. 400-volt paper.   | R <sub>5</sub> — 75,000 ohms, 1-watt carbon.                                      | S <sub>1</sub> — S.p.s.t. rotary stand-by switch.   |
| C <sub>4</sub> — 0.01- $\mu$ fd. 600-volt paper.   | R <sub>6</sub> — 10,000 ohms, 2-watt carbon.                                      | S <sub>2</sub> — S.p.s.t. toggle a.c. input switch.   |
| C <sub>5</sub> — Approximately 10- $\mu$ fd. (see text).                                       | R <sub>8</sub> — 0.15 megohm, 1-watt carbon.                                      | S <sub>3</sub> — S.p.d.t. rotary 'phone-c.w. switch.  |
| C <sub>6</sub> — 0.001- $\mu$ fd. mica.  | R <sub>9</sub> , R <sub>12</sub> , R <sub>16</sub> — 0.2 megohm, 1-watt carbon.   | S <sub>4</sub> — D.p.d.t. rotary meter switch.  |
| C <sub>8</sub> — 0.001- $\mu$ fd. 1000-volt mica.  | R <sub>10</sub> , R <sub>14</sub> — 1000 ohms, 5-watt wire-wound.                 | S <sub>5</sub> — D.p.s.t. knife switch.   |
| C <sub>9</sub> , C <sub>10</sub> , C <sub>17</sub> — 0.5- $\mu$ fd. 200-volt paper.            | R <sub>13</sub> — 10,000 ohms, 1-watt carbon.                                     | M — 0-100 d.c. milliammeter.  |
| C <sub>13</sub> , C <sub>14</sub> — 8- $\mu$ fd. 600-volt high-surge electrolytic.             | R <sub>15</sub> — 60,000 ohms, 1-watt carbon.                                     | T <sub>1</sub> — Replacement type power transformer: 350-0-350 volts at 150 ma.; 5 volts at 3 amperes; 2.5 volts at 3.5 amperes; 2.5 volts at 5 amperes (Majestic). |
| C <sub>15</sub> — 0.1- $\mu$ fd. 200-volt paper.   | R <sub>17</sub> — 3500 ohms, 10-watt wire-wound.                                  | T <sub>2</sub> — Modulation transformer (1:1 ratio audio output transformer).   |
| C <sub>16</sub> , C <sub>18</sub> , C <sub>21</sub> — 1.0- $\mu$ fd. paper.                    | R <sub>19</sub> — 800 ohms, 5-watt wire-wound.                                    | RFC — 2.5-mh. r.f. choke.   |
| C <sub>19</sub> — 0.5- $\mu$ fd. 400-volt paper.   | L <sub>1</sub> — Grid coil for TNT oscillator operation (see Table II).           |   |
| C <sub>20</sub> — 0.02- $\mu$ fd. 400-volt paper   | L <sub>2</sub> , L <sub>3</sub> , L <sub>4</sub> , L <sub>5</sub> — See Table II. |   |
| R <sub>1</sub> , R <sub>11</sub> — 0.1 megohm, 1-watt carbon.                                  | L <sub>6</sub> — Replacement-type filter choke, 10 henries at 150 ma.             |   |
| R <sub>2</sub> — 40,000 ohms, 1-watt carbon.   |   |   |

operation. The Type 47 oscillator tube furnishes enough power to drive the amplifier with good efficiency. When no crystals are available, the oscillator may be tested by using self-resonant grid coils,  $L_s$ , to provide a "TNT" circuit. In this case the blocking condenser,  $C_1$ , prevents short-circuiting the biasing resistor,  $R_1$ . Screen voltage is obtained through the screen voltage-dropping resistor,  $R_2$ .

The oscillator and amplifier stages are coupled by a homemade mica condenser,  $C_5$ . As with most audio tubes, the screening of the 47 is none too good. Neutralization was tried, but found to be very critical. A simpler way of stabilizing the amplifier was found by reducing the coupling between the amplifier grid and the oscillator plate tank to a very low value. The coupling condenser was made by cementing brass plates to each side of a thin mica sheet one-half inch square. The

condenser was then wrapped with dry paper and soaked in thinned cellulose cement of the type known to model-builders as dope. The gadget has a very small capacity and isolates the stages sufficiently without robbing the amplifier of necessary excitation.

The amplifier screen resistance,  $R_6$ , was adjusted for optimum performance. A higher value reduces power output, while a lower value than that specified effects no further increase in output.

The tuning condensers,  $C_2$  and  $C_7$ , have sufficient range to cover either of two adjacent amateur bands without changing coils. Coil dimensions are given in Table II.

Both stages of the transmitter are keyed simultaneously in the common center-tap circuit, the key being connected through a closed-circuit jack,  $J_1$ . The center-tapped resistor,  $R_4$ , and the by-pass condensers,  $C_9$  and  $C_{10}$ , provide a fair

**TABLE II**  
**Transmitter Coil Data**

Frequency	$L_1$ (Osc. Plate)	$L_2$ (Amp. Plate)	$L_3$ (Link)
1.75-3.5 Mc.....	35 turns	35 turns	10 turns
3.5-7 Mc.....	11 turns	14 turns	10 turns
7-14 Mc.....	7 turns	7 turns	5 turns

All coils are wound with No. 28 enameled wire on 4-prong UX tube bases,  $1\frac{3}{4}$ -inch diameter and 1 inch high. Winding length of  $L_1$  and  $L_2$  is  $\frac{1}{2}$  inch.  $L_3$  is wound close to the ground end of  $L_2$ .

$L_5$ —24 turns No. 16 bare copper wire air-wound; winding length,  $3\frac{3}{4}$  inches; diameter,  $2\frac{3}{4}$  inches.

$L_4$ —6 turns No. 16 bare copper wire; winding length  $\frac{3}{4}$  inch, diameter  $3\frac{1}{2}$  inches, air-wound over center of  $L_5$ .

$L_2$ —Wound on 5-prong tube bases with No. 30 enameled copper wire; winding length,  $\frac{1}{2}$  inch; diameter,  $1\frac{1}{4}$  inch.

1.75 Mc.—80 turns

7.0 Mc.—17 turns

3.5 Mc.—34 turns

14.0 Mc.—8 turns

amount of click filtering. No key clicks have been noted with this rig. There is a slight chirp caused by key vibration when the oscillator is self-controlled with a grid coil at  $L_2$ ; but that does not matter much, since it is highly improbable that the operator will wish to use the transmitter on the air without crystal control, except for testing. High voltage from the power supply is applied through the switch,  $S_1$ . The meter,  $M$ , may be switched to read either oscillator or amplifier plate current. The shunting resistances,  $R_3$  and  $R_7$ , are sufficiently high in value to have but negligible effect upon the reading of the meter.

The chassis for the transmitter measures  $3 \times 7 \times 12$  inches. Like the receiver base it is made with the front open to take the panel, which is held on with three screws. The variable condensers are fastened to the chassis as well as to the panel, thus providing extra bracing. The arrangement of components is apparent from the photographs. The policy of keeping as much of

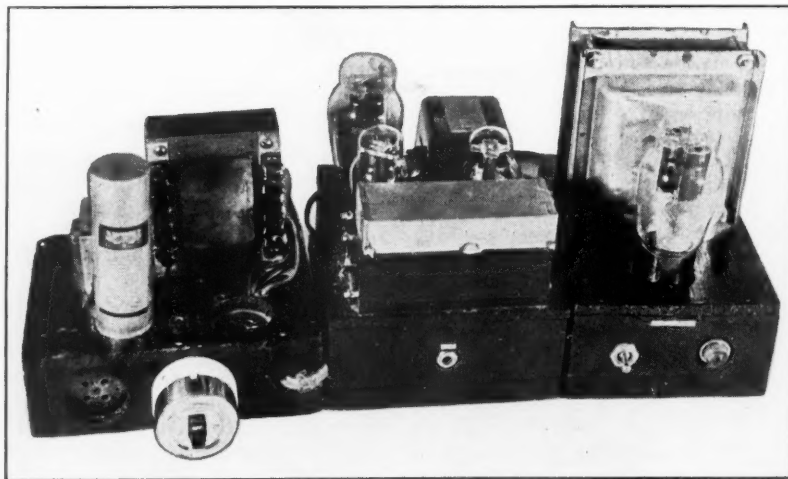
the wiring as possible below deck has been followed in this unit as well as in all of the others except the antenna tuner.

### The Antenna Coupler

The antenna coupler is link-coupled to the amplifier output tank circuit. By means of  $S_5$ , the tuning condensers,  $C_{11}$  and  $C_{12}$ , may be connected either in series or in parallel with the antenna feeders.  $L_5$  is adjusted to proper size for each band by means of short-circuiting taps at each end of the winding, while the coupling may be varied for proper loading by tapping the link winding,  $L_4$ , if found desirable. This provides a wide range of matching to various forms of antennas. It should be possible to match the rig to almost any sort of radiator available. If the tuner is grounded on one side, a single wire may be ended and series or parallel tuned, depending upon its length. With orthodox series or parallel tuning, Hertzian and Zepp-fed half-wave antennas may be driven. With both condensers meshed and the coil untapped, the circuit will resonate at 1.75 Mc. Tapping will take care of the adjustments for any other frequencies at which the operator may desire to operate.

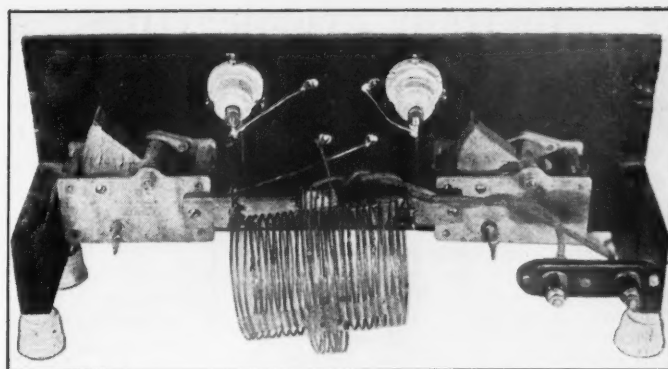
Coil dimensions for the antenna coupler will be found in Table II. The winding is of the self-supporting type with turns spaced by cementing them to celluloid strips. It is mounted on a strip of dry wood coated with shellac. The strip is then fastened to the end plates of the tuning condensers, which are mounted on the panel. The link winding,  $L_4$ , is of larger diameter and is spaced from the antenna coil by small pieces of dry wood.

The two stand-off insulators on the panel serve as antenna terminals. The panel consists of a piece of  $\frac{3}{8}$ -inch board,  $5\frac{1}{4}$  inches high and  $14\frac{1}{4}$  inches long. The panel is supported by a pair of wood blocks,  $\frac{3}{4} \times 2 \times 3\frac{1}{2}$  inches, mounted on



The power supplies and modulator unit. The receiver power supply is at the left, with the rectifier tube removed to show the transformer wiring. The filter choke is behind the condenser at the left. The a.c. toggle switch is in front. Output power may be taken from either the socket at the left or the terminal strip at the rear. In the center is the modulator with the microphone jack in front. The cathode by-pass condensers are mounted on top in the foreground. The unit to the right is the transmitter power supply, with only the rectifier and transformer showing. The input switch and pilot light are in front. The power cord and output connections are at the rear.

The antenna tuner. All components are mounted on the panel. The output terminals are at the top. At the lower right are the low-impedance input terminals. At the center, mounted on a wooden bracket fastened to the variable condensers, is the air-wound coil and its link winding.



ordinary light-circuit fuses to provide clearance beneath the coil. The fuses were used simply because they happened to be handy.

### The Modulator

The plate modulator consists of two stages of resistance-coupled speech amplification using 27s, which drive a 47 in the Class-A output stage. An audio power output of approximately 4 watts is obtained, which will modulate fully an input to the r.f. output stage of 6 watts.

Voltage for the single-button carbon microphone is taken from the plate-voltage supply through a dropping resistor,  $R_3$  in Fig. 3. Attempts to use the voltage drop across the 47 cathode resistance resulted in motorboating. The connection shown provides sufficient voltage for good sensitivity. A speaking distance of six or seven inches is about right for complete modulation of the transmitter output. Speaking close to the microphone will cause overmodulation.

It was found necessary to ground the case of the output transformer to prevent oscillation in the audio section. The modulator should never be operated without a load because the tube and output transformer may be damaged.

$S_3$  is provided to make possible a rapid shift from 'phone to c.w. operation. With this switch set for c.w. operation, the secondary of the output transformer is short-circuited and plate voltage removed from the modulator and speech amplifier.

If the operator desires to remove the modulator entirely, he may do so easily and quickly. The unit is connected to the power-supply and r.f. sections through several wires terminated in 'phone tips. All that is necessary is to pull these tips out of the respective jacks and the modulator has been disconnected. A jumper is then placed across the modulation terminals, numbered 5 and 6 in Fig. 3, and all is ready for c.w. operation.

The only component on the front of the  $3 \times 5 \times 7$ -inch modulator chassis is the microphone jack. On the back are the 'phone-c.w. switch and the various power and output leads. On top the front section is occupied by the bulky cathode by-pass condensers. Behind these are the speech-amplifier tubes, the 47 output tube, and the modulation transformer. All wiring is kept underneath the chassis.

### Transmitter Power Supply

The transmitter power supply is built on a  $3 \times 5 \times 7$ -inch base. On the front are the a.c. power-input switch and a pilot light bulb in a red jewel bracket which indicates whether or not the power supply is turned on. The rectifier tube and power transformer are mounted on top, while the filter components are underneath. At the back are a four-prong socket for the r.f. section power plug and tip jacks for the modulator heater and high-voltage connections. Placing the r.f. section and modulator on either side of the power-supply unit shortens the heater leads and reduces voltage drop.

The transmitter is tuned in the usual manner by observing the dips in plate current as each tank circuit is tuned to resonance and the rise in plate current when the antenna is tuned to resonance after the antenna and amplifier tank circuits have been coupled. As a last adjustment, the amplifier plate circuit should always be retuned for minimum plate current.

This equipment was built after Pearl Harbor and consequently has never been tested under actual operating conditions, but enough data has been gathered from dummy-antenna work to justify a prediction of the practical performance of the station. It is easy to build, easy to use and, best of all, it does not require the outlay of a small fortune in cash.

### Strays

The first successful television broadcasts in Uruguay have been carried out by Mario Giampietro, a ham since 1924, using amateur equipment developed in the face of the wartime handicaps of restricted scientific data and scarcity of materials. Receiving official recognition from the Uruguayan government and using the call CXHAQ, to date he has carried out his experimental work on 115 Mc. Images from his transmitter, broadcast from an antenna only sixty feet above street level, have been picked up clearly by other amateurs more than a mile away. A commercial company is being planned to finance further experiments.

# Amateur Broadcasting—A Menace

*Does Private Communication Imperil the Bright New World?*

BY J. K. BACH,\* W4CCE/3, EX-W9WGM

Judging from past experience, publication of this essay may result in a storm of protest which will lift the roof at 38 LaSalle Road. Some will denounce OM Bach as anti-amateur, failing to perceive the gentle irony in his words. Others will cudgel editorial skulls for exposing our weaknesses to public view. A few, even, will read into its publication a veiled forewarning and conclude that ARRL is planning to sell short the amateur bands.

Yes, we've learned that there are always those who are unable to comprehend a jest or who prefer to read dire omens between the lines. In this instance there should be no need for either; the article is plainly labelled as satire, and we state categorically that there is no hidden motive behind its publication—except, possibly, to show how superficially plausible such specious arguments could be if they were presented by someone with an axe to grind.

THE electronic age into which we are now entering promises many wonders to make our lives easier and more pleasant. Developments in manufacturing, housing, transportation and communications—all promise a bright new world. But it is about communications that I wish particularly to speak.

When new automobiles again run on our highways they will undoubtedly be equipped with radar, as will every other vehicle. No longer will airplane, train or even the sputtering motorcycle crash into hidden obstructions, thanks to the wonders of science. Radar can even be applied to the home, as a burglar-alarm, for example, or to detect obstructions on the cellar steps. Electronic devices will find many other uses as high-frequency paint-dryers, veneer-glueers, and even cord-less permanent-waving machines for the ladies. Garage-door openers and other remote-control devices are not only possible but practical. Then there are certain to be other applications such as personal pedestrian telephones, two-way wrist-radios and nursery baby-ery announcing systems.

Before all these wonders can be fully realized, however, something must be done about the chief obstructionist—the amateur broadcaster. For many years his antennas have depreciated property values and created lightning hazards. He has been absorbing broadcast waves and creating various disturbances such as static, fading and fluttering in the broadcast band. He has created

\* Box 42, Lawrenceville, N. J.

intolerable interference to innocent listeners with his meaningless code and chatter.

Defenders of the amateur broadcaster have made much of his discovery of the utility of short waves. That he stumbled upon this discovery is by no means remarkable; as Mark Twain said: "It was wonderful of Columbus to have discovered America but it would have been even more wonderful to have missed it." It is a matter of record that his confinement to 200 meters was not voluntary, but instead was brought about because of his interference with other services and general worthlessness even in days gone by.

## Silly Claims

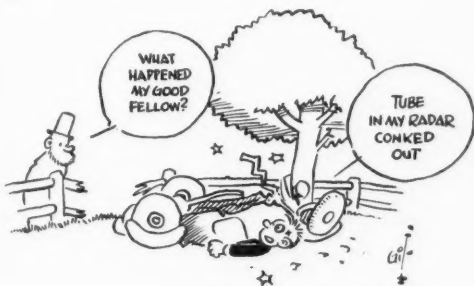
And what, indeed, has the amateur broadcaster done with his discovery? He has filled up the wave-bands with inane conversation of no discoverable meaning or value. His claims to usefulness during national disaster are transparently silly, not to say fraudulent. There is no mention of these services outside of his own radio magazines; and even if they do exist, there is nothing he has done or can do that would not be better done by public service, telephone and railroad companies, with expert operators and commercial equipment designed by engineers of training and experience. In this connection, it is significant that the amateur broadcaster has no official place in the War Emergency Radio Service (though a few have managed to enter the organization, possibly by concealing their amateur broadcasting background).

The amateurs are also vociferous about being a reserve of trained operators for military service in time of war. This is, of course, absurd; the Signal Corps has its own training schools, and so could have little use for hobbyists whose chief occupa-



tion before the war was annoying legitimate radio users such as broadcast listeners. Besides, it must be apparent by this time that, in an intelligently planned world, war cannot exist. Granting, for

the sake of argument, that the amateur broadcaster was useful in this war, there could be no use for him in the future. Gratitude, even if it seemed to be indicated, has no place here, if only



because the amateur broadcaster will never again be called upon for war communication service, because there will be no more wars. The Anglo-Saxon powers will see to it that no aggressor nation ever again can take the civilized world by the throat.

As for the technical advances sometimes attributed to amateur broadcasters, it must be obvious that no hobbyist could compete with the great commercial laboratories. It is well known that they must buy most of their equipment, and such equipment as they themselves build almost invariably is only a slavish copy of successful commercial equipment, since obviously they themselves cannot design other than rudimentary instruments.

### Civilization Imperiled

It is becoming increasingly obvious that amateur broadcasting can no longer be permitted if civilization is to progress. Who can tell how many airplanes, trains and other vehicles will crash into hidden obstructions and cause serious loss of life only because some boy, playing with amateur broadcasting, has interfered with the proper operation of their radars?

And in any case, how could there be room for amateur broadcasting in a spectrum already overcrowded, even without the new assignments which must be made for wood-gluing, paint-drying, soldering and other similar processes not yet discovered?

It might be asked why the amateur broadcaster has been permitted to clutter up our frequencies for so many years. The answer is simple: he has organized himself into an association which has a lobby of sorts, as well as press representation; the latter, fortunately, not very effective. While not so efficient as some others, these agencies have been instrumental in preserving the amateur broadcaster's privileges to the annoyance of industry and the public at large.

Is there a remedy? Indeed, yes. Fortunately, those in authority have practically unlimited powers in wartime, and the said authority may be — indeed, *must be* — continued after peace once more spreads her comforting wings over a

war-torn world. Nothing could be simpler than to extend, so as to cover the entire country, the present military zones within which private (as distinguished from commercial) communication systems are forbidden — as indeed they should be in this day of air power. To do so would require no legislation; a directive would be sufficient authority.

But this might not be permanently effective; what of the voting strength of the amateur broadcaster? Fortunately, he does not use it to the best advantage, and since, save as an unmitigated nuisance, he is unknown to the general public, of which he forms a very minor fraction, he can be safely and easily suppressed.

A long-term policy to rid the country of the amateur broadcaster might well begin by restricting his operations to the region above 1000 Mc., with a maximum radiated power of three watts, an assigned beam direction of not over 15 degrees spread in any dimension, and, of course, a time schedule.

Heavy taxation would also be effective. First, it would discourage a practice which at present cannot expediently be legislated against, as the possession of firearms has been. (Heavy taxation has been valuable in the past; as an outstanding example, the use of white phosphorus in the manufacture of the common kitchen match has been discouraged solely by this means.) Second, the funds thus obtained could be added to the billions needed to finance the agencies that will be needed to regulate and administer the many affairs of our brave new world.

## Missing In Action

VE2MV, Sub-Lt. Gordon W. Wright, RCNVR, of Montreal West, P. Q., is reported to be missing in action.

### Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1DIR, William J. Meekin, Rockland, Mass.

K6KMB, Ernest A. Johnstone, Honomu, T.H.

W6VB, W. G. Gauthier, Santa Monica, Calif.

W8BOW, Lt. W. W. McLain, USN, Wheeling, W. Va.

W8ULR, Paul A. Yhouse, Frankfort, Mich.

W8WMQ, Edward R. Dirling, Larimer, Pa.

Pfc. Franklin H. Chesebrough (operated at W8AIV), Toledo, Ohio.

VE5AGD, P/O E. R. Seibold, RCAF, Vancouver, B. C.



# STRAYS



Students at the New York Institute for Education of the Blind are proving that sightless persons can become competent radio technicians. According to their instructor, Robert Gunderson, W2JIO, who is himself blind, they can perform such tasks as soldering just as neatly and very nearly as quickly as sighted persons.

The Institute's radio course, which was introduced to provide training culminating in amateur operator and station licenses, has been extended to include thorough training in repair work. To overcome the problem of inability to read visual measuring instruments, a special meter, equipped with voltage, current and resistance scales and employing a vibrator, headphones, Braille scale and multiplier, has been adapted for their use. The students construct many types of complex circuits in the laboratory so that if they run into complicated equipment their general working knowledge sees them through. While the program has been in operation only since September, 1943, to date over 700 receivers, donated by civilians, have been serviced for use by the Army in camps, hospitals and overseas.

The launching of a liberty ship bearing the name of Samuel F. B. Morse, inventor of telegraphy, will be part of the Morse Centennial anniversary observance on May 24th.



This is Guadalcanal's "Radio City." Built in a typically muddy grove of coconut trees, the island's new American Expeditionary Forces radio station, named the "Mosquito Network," brings the latest in news and entertainment to the thousands of soldiers, sailors and marines in the Solomon Islands. The studio, a 20 x 40-foot board shack consisting of two rooms, is the last word in Guadalcanal luxury. The Mosquito Network was set up under direction of the Armed Forces Radio Service of the Morale Services Division of the War Department. Its program director is Capt. Spencer M. Allen, W9JGL, formerly public relations officer at Ft. Monmouth, N. J. — whose picture, incidentally, appeared on the cover of *QST* for November, 1942. *Official U. S. Marine Corps Photograph.*

JANUARY						
M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

FEBRUARY						
M	T	W	T	F	S	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

MARCH						
M	T	W	T	F	S	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

If the Edwards Perpetual Calendar, the first three months of which are shown above, were adopted, we wouldn't have to worry any more about Friday the 13th! Devised by Lt. Willard E. Edwards, USNR, W6ATM-ex-W1IE (see *Hamdom*, p. 41, in this issue), the plan designates New Year's Day as a day apart which is followed by a 364-day year. This is divided into quarters of equal length, the month lengths in each quarter falling into the pattern of 30, 30 and 31 days and the first day of each month being successively Monday, Wednesday and Friday as shown above. Each week would begin with Monday, allowing Saturday and Sunday to become the week-end by the calendar dates as well as in fact. In leap year, "Leap-Year Day" would be observed as a day apart between June 31st and July 1st, as the first day of the second half-year.

The remarkable speed of the Army's global communications system, operated by the Army Communications Service of the Signal Corps, was demonstrated recently for Maj. Gen. L. G. Phillips, Chief of the British Royal Corps of Signals. During the half-hour Gen. Phillips spent inspecting the War Department Signal Message Center in the Pentagon Building, a test message was flashed around the world in an east-bound direction and received back in the War Department. Sounds to us as though hams must have promoted that relay test!

To help soldiers master radio operating in order to qualify as members of combat crews, code instruction at Scott Field, Ill., parent radio school of the AAFTTC, now is being carried on by use of a multivibrator as a tone generator. It consists of two oscillators fed by a 6N7 and provides tone variation from 50 to 15,000 cycles. As the multivibrator is somewhat unstable the monotonous evenness in tone of the usual generator is avoided, and the sound more closely approximates actual on-the-air transmissions.

A recent check of membership files shows that about 2500 ARRL members in military service now have overseas addresses.

A program designed to acquaint the public with the valuable work of radio amateurs in the armed forces and in industry is being broadcast every Saturday morning at 7:30 A.M. over WJJD, Chicago, on 1160 kc. Sponsored by the Newark Electric Co., this program is another friendly voice in the steadily growing chorus of those who are publicly boosting ham radio.

According to a report in *Radio and Hobbies* for February, 1944, a conventional pentagrid converter such as the 1A7GT is susceptible to external magnetic influence and therefore should be kept away from the field coil or permanent magnet of a loudspeaker. Since the oscillator anode is simply two rods, one on each side of the cathode, distortion of the electron stream by a magnetic field reduces their effectiveness.

The water circuit breaker is now coming into prominence in the protection of high-voltage, high-power circuits. The formation of steam by the heat of the arc produces a strong deionizing effect which helps to snuff out the arc. — *Ohmite News*.

Many audio-frequency circuits require a variable iron-core inductance tunable to audio frequencies. Such circuits include those of various types of audio oscillators, peaked a.f. amplifiers, equalizers and filter networks. Permeability tuning, commonly used in r.f. coil construction, is not feasible at audio frequencies because of the small range of inductance variation possible and the low *Q* at such frequencies.

In such circuits a device recently developed by the United Transformer Co. may be employed to advantage. The UTC-VI-C inductor embodies a simple, positive method for varying the inductance of a coil having a magnetic core, through a range 90 per cent above and 50 per cent below a mean value. It is obtainable in mean inductance values from 10 millihenries to 10 henries.

The unit is housed in a die-cast case measuring  $1\frac{1}{4} \times 1\frac{7}{16} \times 1\frac{7}{16}$  inches and weighing approximately 5 ounces.

One day recently in the instructors' code-practice class at Fort Monmouth the signals stopped for a time. I called CQ and signed my call and who should come back but W2MCR. Needless to say, we had a fine QSO on the 440-cycle tone. — *W9TWO*.



Radar gremlins are very rare, according to L. H. Cook, ARM1c, USN, W9FWW, who sent us the picture at the left. This particular gremlin has been "tamed" by W9FWW's outfit and has become its mascot.



Marine Corps raiders and paratroopers now receive their orders over "Raider" receivers such as the one shown above. Produced by Emerson Radio and Phonograph Corp., the "Raider" is a compact kit containing receiver and battery and is carried on the marine's chest, thus leaving his hands free to carry out such incidental tasks as killing Japs. The headphones are built into a fabric cap and fitted into the metal helmet, which serves as the antenna. The kit is so constructed that it will withstand immersion, shock, heat and cold. Unlike most radio equipment in use by the armed forces the "Raider" is practically invisible, thus safeguarding its operator in that it does not distinguish him from his companions. *Official U. S. Marine Corps Photograph*.

A new type of solder which contains flux in longitudinal grooves on the surface rather than in the core, as is conventional practice, has been announced by the National Lead Co. of New York City. Since the flux is on the outside it flows onto the work before the solder melts, thus insuring complete fluxing which results in stronger joints. Gaps in the flux are avoided as the flux is clearly visible and can be checked readily.

The cross-bow, weapon of medieval times, is being used by a Westinghouse research engineer to draw out delicate quartz filaments which are used as measuring sticks for the magnifying power of the electron microscope. To make the filaments the bow is placed in the firing position and the arrow attached to a small piece of quartz. Using an oxy-hydrogen torch, the quartz is heated until it is about to melt. The arrow is then released, drawing with it quartz filaments so fine that it would take 60 of them to make the thickness of a human hair. The bow is used because it provides the high initial burst of speed required to spin out the quartz while it is in a hot, fluid state.

Robot planes of 8-foot span, operated by radio control, have been used for targets in maneuvers with ground troops.



## HINTS AND KINKS FOR THE EXPERIMENTER



### A V.H.F. AND U.H.F. CONVERTER USING A CRYSTAL DETECTOR

AN EXPERIMENTAL converter for reception on the very-high and ultrahigh frequencies is shown in Fig. 1.

A crystal rectifier is employed as a diode mixer. Crystal detectors are commonly used in ultrahigh-frequency work, since they will function at frequencies where the transit-time effect present in an ordinary diode or other vacuum-tube detector would result in impaired operation.

The oscillator tube may be a 7A4 if the converter is to be used only for reception in the 112-Mc. band. However, since interest in the experimental development of higher frequencies is a prime consideration in the design of the converter, a 955 acorn triode should be used as the h.f. oscillator if one is available.

Coupling between the oscillator and detector coils should be very loose. A spacing of about 2 inches gives ample injection voltage. In fact, a spacing of 6 inches works almost as well. If the coupling is made too tight signal levels drop and the noise level rises.

A tendency toward superregeneration in the oscillator was cured by omitting the usual r.f. choke in the plate circuit and substituting the 20,000-ohm resistor shown in the circuit diagram.

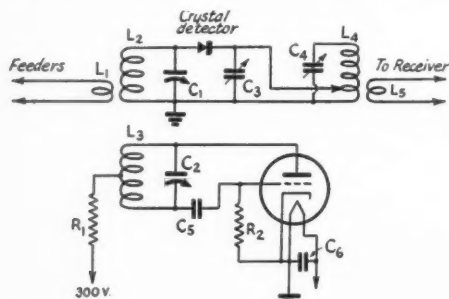


Fig. 1. — Circuit of a converter for v.h.f. and u.h.f. using a crystal detector as a diode mixer.

- C<sub>1</sub> — 3-plate midget variable (approximately 5- $\mu$ fd).
- C<sub>2</sub> — 15- $\mu$ fd. midget variable.
- C<sub>3</sub>, C<sub>4</sub> — 3-30- $\mu$ fd. mica trimmer.
- C<sub>5</sub> — 100- $\mu$ fd. mica.
- C<sub>6</sub> — 500- $\mu$ fd. mica.
- R<sub>1</sub> — 20,000 ohms, 1-watt.
- R<sub>2</sub> — 0.25 megohm,  $\frac{1}{2}$ -watt.
- L<sub>1</sub> — 1 turn No. 14,  $\frac{1}{2}$ -inch diameter.
- L<sub>2</sub> — 5 turns No. 14,  $\frac{1}{2}$ -inch diameter, turns spaced slightly more than diameter of wire.
- L<sub>3</sub> — 4 turns No. 12,  $\frac{1}{2}$ -inch diameter,  $\frac{1}{2}$ -inch winding length.
- L<sub>4</sub>, L<sub>5</sub> — I.f. transformer for input frequency chosen on the receiver to be used.

The crystal-rectifier output is tapped down on the i.f. transformer coil, at about one turn from the ground end.

Output from the converter may be fed into the front end of any sensitive receiver capable of tuning to 28 Mc. or higher. In our case the receiver was a 7-tube superheterodyne using tubes of the 6D6 vintage and built some years ago for 56-Mc. reception. Its input is tuned to 40 Mc. and the intermediate frequency is 5 Mc.

Tests have covered the range from 112 Mc. to about 150 Mc. No direct comparison has been made with a superregenerative receiver, but comparisons with other superheterodyne receivers used on 112 Mc. indicate that this converter gives superior performance.

Extension of amateur interest to operation in the microwave region points to the desirability of experimentation with this receiving circuit, using an acorn oscillator tube and striving for every possible gain in efficiency. While constants for 112-Mc. operation are given in connection with the circuit diagram, such operation should be regarded only as a point of departure. — Bernard W. Bates, W1BBM, North Harwich, Mass.

### NEAT FINISH FOR HAM GEAR

WHEN the amateur bands were open and QSOs inviting, much ham gear was thrown together without regard to external appearance. Now, however, the rush to get on the air is no longer an excuse. Parts are hard to get, and if the amateur experimenter is lucky enough to have the wherewithal to undertake any constructional project, he should make the most of it. He can take the time to satisfy a proper sense of pride in the appearance of his work.

The photograph shows the panel of a v.t.v.m. recently constructed. The case was purchased for \$2.00 from a wholesale radio house. The aluminum panel once served as the lid for a broiler. (Heaven forbid that my wife read this!) If no broiler is on hand, see the junk dealer. The 0-1 milliammeter was obtained from a jewelry store by vague promises, threats, and the tender of \$1.50. Its sad, cracked face and scratched case were rejuvenated. Other parts were such as are to be found in most junk boxes.

The metal for the panel was first rolled flat and cut to within 1/16 inch over proper size, and then filed to an exact fit in the case. In locating and drilling holes care was taken to avoid scratches. The panel then was given a satin finish by sand-blasting. The polished border was secured by

placing adhesive tape around the edge before sandblasting. A light blast of about 15 pounds pressure produced a satin finish on the exposed aluminum.

If the job is taken to a commercial establishment, the cost of sandblasting should be about half a dollar. If no means of sandblasting is at hand, the use of steel wool and elbow grease is in order.

Care was exercised in handling the panel after this first finishing operation, since the surface is such as to be easily soiled by fingerprints or other contacts. A paper mask was provided to cover the portion of the panel left unpainted.

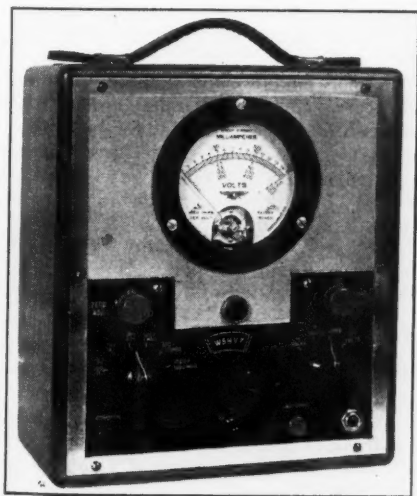
The painted portion was sprayed with two coats of telephone black, leaving a dull finish for lettering. If regular paint-spraying apparatus is not available, an insect-spray gun will serve. Some preliminary practice is advisable.

After the paint was dry the switches and all other parts were mounted. The panel then was marked for lettering, the mask being left over the unpainted portion. A very fine brush and silver watercolor paint were used for the lettering. Water-soluble paint was chosen, since it lent itself most readily to occasional necessary emendations in the work.

When pride was finally satisfied with the printed efforts, four or five coats of thin clear varnish were sprayed on. Each coat was allowed to dry thoroughly before applying the next. Lacquer was not used, since it will dissolve certain kinds of paint.

After removing the mask, except for the tape around the border, a final protective coat of varnish was given the entire panel. This was a very thin coat, since heavy applications of varnish give a yellowish cast to the aluminum.

When the final coat was thoroughly dry the tape was removed from the border, which then was buffed to a bright finish. — *Lt. Carroll E. Humphrey, W5HVT, 1712 Adeline St., Fresno 4, California.*



This v.t.v.m. shows the pleasing effect of an application of W5HVT's suggestions for finishing panels.

## A PUSH-PULL INFINITE-IMPEDANCE DETECTOR

ALTHOUGH the diode detector is widely used as the second detector in superheterodyne receivers because it is capable of handling large signal voltages and also because it provides a ready means of obtaining a voltage for a.v.c. purposes, its low resistance greatly reduces the selectivity of the transformer feeding it.

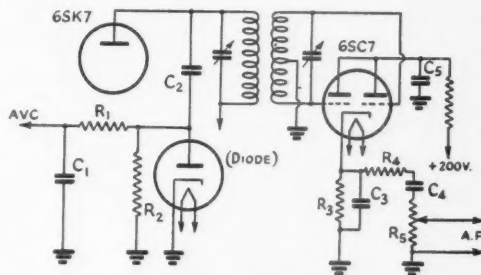


Fig. 2. — Circuit of a push-pull infinite-impedance input detector with a.v.c. voltage obtained from a separate diode.

- C<sub>1</sub>, C<sub>4</sub> — 0.1- $\mu$ fd. paper.
- C<sub>2</sub> — 50- $\mu$ fd. mica.
- C<sub>3</sub> — 100- $\mu$ fd. mica.
- C<sub>5</sub> — 8- $\mu$ fd. electrolytic, 400 volts.
- R<sub>1</sub>, R<sub>2</sub>, R<sub>4</sub> — 1 megohm,  $\frac{1}{2}$ -watt.
- R<sub>3</sub> — 0.1 megohm,  $\frac{1}{2}$ -watt.
- R<sub>5</sub> — 1-megohm potentiometer.
- R<sub>6</sub> — 10,000 ohms,  $\frac{1}{2}$ -watt.

Results comparable to those obtained with the diode detector can be realized by the use of cathode coupling in an infinite input-impedance detector. However, a disadvantage of this type of detector is that a.v.c. voltage is not readily obtained.

In the circuit shown in Fig. 2, a push-pull infinite-impedance detector is used in connection with a separate diode which supplies a.v.c. voltage from the plate circuit of the i.f. amplifier. This circuit gave good results when installed in a Meissner all-band receiver. It accepts signals of relatively high amplitude without overloading or distortion.

The detector tube used is a 6SC7 dual triode, operated close to cut-off. Suggested circuit values are given in the caption for the diagram. — *C. W. Moorhouse, P. O. Box 242, Chilliwa, B. C.*

## SIX-VOLT SOLDERING IRONS

EVER wish you had a soldering iron in the car? A. D. Hewett of Powell River, B. C., tells how he made a 6-volt soldering iron which can be used on either a.c. or d.c.

The tip was made of a piece of  $\frac{3}{8}$ -inch copper rod about 3 inches in length, one end of which was bored to a depth of  $2\frac{1}{4}$  inches with a  $\frac{1}{4}$ -inch drill.

The heating element is a 12-inch length of No. 25 Nichrome wire wound in a spiral to an outside diameter of  $\frac{3}{16}$  inch. The upper end of the spiral was led back through the coil and brazed to a piece of No. 12 copper wire about 10 inches long.

(Continued on page 82)



## CORRESPONDENCE FROM MEMBERS

The Publishers of *QST* assume no responsibility for statements made herein by correspondents.

### IMMEASURABLE CONTRIBUTION

Eastern Signal Corps Schools,  
Ft. Monmouth, N. J.

Editor, *QST*:

... Much has been published about the Enlisted School so you are probably familiar with it as a whole. In general, our mission has been and is to train the thousands of specialists needed by the Army in the fields of radio and wire work. Judging by the comments received from many battlefronts, our graduates are carrying on with the motto of the Signal Corps in "getting the message through." In the accomplishment of this mission, the amateur has been and is playing a vital part. In fact, during the tremendous expansion of the school in 1942 and 1943, amateurs comprised the backbone of our instructional staff and ... they still comprise a large proportion. The technical skill, interest and devotion of this group, both officers and enlisted men, to radio has contributed immeasurably to the success of our school. Words cannot express my gratitude to them for the fine work they have done and are doing.

Much of our text material and many instructional ideas have been derived from our files of *QST* and *The Radio Amateur's Handbook*. They are invaluable.

— Lt. Col. G. R. MacEachren, W2DWI  
Officer in Charge, Radio Division, EMS

### HAMS IN CIVIL SERVICE

44 W. 55th St., Jacksonville, Fla.

Editor, *QST*:

... I thought I would drop you a line and let you know how an old ham broke into Civil Service work down here. I was retired for about one year, but when we got into this war I thought I might be of some help. ...

Being a ham since 1915 I believed I could help out along the radio line. So I filled out about 35 or 50 papers for the Civil Service and waited about four months before I was called to work. All the Civil Service papers inquired about places where I had worked, but not about my hobby. When I came to work here I found ten BCL service boys and two hams. The hams learned the work very quickly, as all good hams do, but the BCL service boys knew nothing about the transmitters or frequency meters or communications receivers. The hams were head and shoulders over these BCL boys, but got no credit for their hobby on the Civil Service questionnaires. ...

I have spent hundreds of dollars on amateur radio, learning the hard way, and like most hams

I built almost every kind of a rig I could afford. ... But I find the Civil Service doesn't think of a ham as being any better than a BCL serviceman, who doesn't know anything about transmitting equipment.

Also the boys and girls who go through government schools at great cost are rated much higher than the poor old ham who spent many a dollar for parts to make his rig work.

I guess there is not much that can be done about it but, as an old ham working with them, it surely gets my goat. I worked for about ten months as 3rd-class mechanic, and raised hell before I was given a higher rating. I worked almost a year before I got 1st-class. ...

— W. H. Butts, W4CGG-W4HPI

508 Old Town Bank Bldg.,

Gay St. & The Fellsway, Baltimore, Md.

Editor, *QST*:

The January, 1943, issue of *QST* listed my name and call in the In the Services department. At that time I was a corporal in the Signal Corps receiving training as a radio operator at Ft. Monmouth, N. J. I had just completed my training in May when, due to ill health, I was honorably discharged and returned home. I was re-employed by the Bendix Radio Corp. as transmitter test engineer and on December 20th I reported for active duty with the FCC as RI, my appointment having been approved some time earlier.

My experiences with radio started at the age of twelve, at which time I obtained a Class B ticket. The experiences I have enjoyed since that time as an active ham have undoubtedly been effective in enabling me to progress rapidly in the field of commercial radio. For example, on the exam for the position I now hold, the Civil Service Commission rated my Class A experience as equivalent to a year of college work. So, as you can see, I can't say enough for our mutual hobby. ...

— David C. White, W3FUV

### ON GOOD AUTHORITY

76 Fillmore Ave., Salamanca, N. Y.

Editor, *QST*:

... In the March issue of *QST* I read of the rating of Navy Radio Technician. I expected to be placed in 1-A very shortly, so I called the Navy Recruiting Office and asked if I could take the Eddy Test. They asked my age and draft status. When I said 36 and 3-A, they said the test was being given only to 17-year-olds and to those over

38. I explained that I had it on very good authority that I could take the test, so they said to come in and see them and to bring my "authority" with me. I went in, and after they read the item in U. S. A. Calling in March *QST* I was allowed to take the test. Last week I received a letter from the Navy Department saying I had passed it, so now I am waiting to be called.

Many thanks to you and *QST*. May you always keep up the good work. . . .

— Gilbert H. Strassle

#### THE WAY HE FEELS ABOUT IT

Radio School, S.T.C., Troy, Ala.

Editor, *QST*:

I find that I cannot apply for membership in the ARRL without telling you how one American feels about this organization. I am just an ordinary young American doing his part for Uncle Sam in radio work. Perhaps I'm an unusually emotional young American; perhaps not. But let me get to my point.

For some time now I've been meaning to join but never before "bothered to." Then today I was looking through the *Handbook* and read just how it all started and how really wonderful it is. I understand the organization is open to other countries, but to me it seems as strictly American as the famous American corner drug-store. Yes, sir, you can count on this new member for full cooperation and loyalty till the day he dies. I consider myself honored.

— Louis F. Poole, jr.

#### HE JUMPED AT THE CHANCE

Somewhere at Sea

Editor, *QST*:

Having read ZLAAF's letter in the February issue of *QST*, I immediately sat down to run this off the mill.

I was fortunate enough to visit Christchurch, New Zealand, in May, 1943. Upon arrival at that port the radio transmitter was inspected by a New Zealand RI, who happened to be Edward Pratt, ZL1GU. At that time the ship had been out of the States for about eight months and I jumped at the chance to talk ham radio with a ZL. Although I talked with ZL1GU only about an hour, I learned many interesting facts about amateur radio in New Zealand.

Unfortunately, we stayed in Christchurch only a day and a half so I was unable to communicate with any other ZLs. On my next visit to Christchurch I certainly will look up ZLAAF.

— Ens. William O. Hans, USMS, W6TBP

#### FROM SOUTH AFRICA

100 Clark Rd., Durban, South Africa

Editor, *QST*:

I am now on a few days' leave . . . and though it's only a few days I'm finding time to glance through my issues of *QST*. . . .

I have been all over the States and I'm proud of America and all she fights for, and I'm proud of the ARRL and the wonderful job of work it is doing in these dark days. . . .

I'm just one of thousands of amateurs riding the skies as radioman-gunner. We amateurs all know the full importance of radio in war and, of course, particularly in air war.

I now am stationed at Queenstown, which is in the Cape Province, getting plenty of flying hours and hours in Morse and, of course, R/T. . . .

Just recently I completed a short refresher course at the only military radio school in this country. They call it the "Radio City of South Africa," and believe me it's worthy of that name. This school was opened just over two years ago to train all radio personnel. Many hundreds have graduated in the various wireless trades since it was opened — radio mechanics, wireless operators and air gunners. This school is specifically for air force personnel: SAAF, RAF, RHAF, and I met a few RCAF guys undergoing training. The number of pupils under training at this school must be considered confidential, but I assure you it's a figure that would cause Hitler a slight headache. . . .

I came in contact with those good sets produced by American manufacturers. . . . I wish to tell you people over there who are producing these sets, especially you womenfolk, that you're doing a grand job. Keep up the good work, and let's all hope that we will be QSOing again soon.

— Radioman-Gunner Vivian Roy Symes, SAAF

#### REGARDING FILAMENT VOLTAGE

Dysart, Iowa

Editor, *QST*:

I may be sticking my neck out and asking for an argument, but I think the suggestion of W2IXK in the Correspondence section of the April issue, page 56, regarding reduction of filament voltage on thoriated filament tubes when application of plate voltage is involved, is a bad idea from the standpoint of tube life.

This procedure is good practice when bright tungsten filaments are involved, but never in the case of thoriated filaments have I ever seen any recommendations from the manufacturers that this is advisable when plate potential is to be applied. It is during stand-by periods only, when shut down would be more harmful due to heating and cooling, that reduced voltage of thoriated filaments is advisable.

I believe Mr. Abell's advice would be detrimental to the less well-informed hams if practiced, resulting in reduced tube life.

— Chauncey Hoover, W9KWY

#### MAKING THE CAT SPIT

1616 Pandora Ave., Los Angeles, Calif.

Editor, *QST*:

Looks like we can go only just so long before we get into our standard dither over the advisa-

bility of reducing power limits. TOM, bless him, deliberately used to start these arguments periodically to see if everybody was awake. It sort of sharpened up the gang and got 'em out of the rut.

Growing gradually more cynical with the years, I am inclined to suspect that the present instance is the fine Connecticut hand of K. B. W. following the Maxim precepts and rubbing the cat to make him spit — so everybody from the young squirts to the old poops leaned back and took aim along with kitty.

Well, that's all to the good. It's healthy, for it lets everybody advance his pet theories to a large audience — a sort of jury of his dissenters. But if the audience doesn't listen, nobody benefits. Every ham or would-be ham who carefully digests the contents of *all* of those letters in April *QST* will be a better ham for it, for whichever side he's on he'll have a clearer understanding of the other fellow's viewpoint. And it will be sympathetic understanding — something absolutely necessary to any large group of otherwise disassociated individuals crowded together in common enjoyment of a hobby.

It doesn't make any great difference which side of this discussion I'm on — most people in my end of the band know where I've stood for the past twenty years, and I don't expect to change in the next twenty if I can help it. But it does me good to hear the other fellow sound off, too. I envy him because he's smarter than I am, and perhaps he envies me because I happen to have more juice. But I don't want to change places with him — nor do I think he really wants to change places with me. He enjoys a definite feeling of justifiable pride in results that stem from intelligent and careful use of less powerful equipment — results that outshine the big rigs time after time, and that is something I can never have. So, in the main, everybody's happy.

A short time ago, in one of our outflung Army posts, I met an officer who had an interesting system for getting proper perspective on the other fellow's situation. Whenever two of his junior officers got in each other's hair over interdepartmental problems, he simply made them trade jobs. That way each man could do the other's job just the way he thought it should be done, and it worked out fine. Of course, I'm not suggesting that we do that, it not being quite practical. But if we put it on the agenda every so often — let everybody talk and pay attention to what he says — then we'll all keep a better balance, the Old Man will smile in his sleep, and we'll present a solid front on that day when we *may* have to fight to use any power at all.

— William A. Lippman, jr., W6SN

#### POSTWAR SERVICE TO THE NATION

4158 Ridge Rd. W., Spencerport, N. Y.  
Editor, *QST*:

... I take it that the League is discussing postwar activities from every viewpoint in accordance with that declaration of purpose which

reads: "The primary aim of amateur radio heretofore has been and henceforth shall be *service to the nation*." Obviously, a discussion of postwar activities should include the fact that the amateur's service to the nation is not and shall not be limited only to technical and operating contributions.

In his letter published in January *QST*, Frank Heubner very correctly says that the amateur is an "ambassador of democracy." I would like to add that the radio amateur because of his unique position is Uncle Sam's *best* ambassador of goodwill and friendship, and that amateur radio, because of its unique character, is the only radio organization which really serves the nation first and only.

The technical and operating skills of the postwar amateur undoubtedly will reach higher levels of proficiency, but it is his message and his natural ability to deliver it cordially and intimately that will bring new hope to those who will look to this nation for guidance after the war. Peace will be tougher to win than war. You can destroy faster than you can build, and we shall have to build materially, spiritually, economically, politically and culturally, not only within the enemy territory but also within the boundaries of some of our allied friends, if we want to have everlasting and real peace.

Our leaders have long recognized the power of radio as a medium for promoting mutual understanding. I wonder if they realize that amateur radio is the only natural, absolutely unselfish medium that can really do a good job of that. The business man looks out for his business interests, the politician for his political interests, the diplomat for his diplomatic interests. The amateur's interest is purely and exclusively friendship and the feeling is invariably mutual. The amateur reaches the home of the people, talks with them and calls them by their first names. . . . The business agent, the politician or the diplomat may visit the people, but the mere disclosure of their identities immediately puts the people on guard. When a radio amateur is discovered in any part of the world he could get the other guy's last shirt if he asked for it.

One outstanding example of radio's influence has been the promotion of cultural relations between the Americas. Yet there is the belief in Washington that, while Latin Americans are now positively sure of a democratic victory, "there remains the *long problem* of convincing Latin Americans of the sincerity of the United States policies and of winning the confidence not only of leaders and government but of *people*."

The whole world will be watching our nation's policies, particularly Latin America. The whole world will want to understand our nation's policies. Can the businessman, the politician or the diplomat do a good job sincerely and unselfishly? I don't think so. The businessman will deal with businessmen, the politician with politicians, the diplomat with diplomats — but we will deal with the people right at home.

(Continued on page 90)

# OPERATING NEWS

**CAROL K. WITTE, W9WUP**  
Acting Communications Manager

**LILLIAN M. SALTER**  
Communications Assistant

## Frequency Tolerances Remain Unchanged.

Earlier this year the League conducted a survey among WERS organizations to determine whether the greater majority of licensees favored a change in Section 15.25 of the WERS rules and regulations, or whether the majority favored no change in the existing frequency-tolerance requirements. A total of 75 replies were received from licensees in 28 states (there are WERS licensees in 36 states), which gave a fairly good cross-section of the thought on this matter from coast to coast. These replies were segregated into three divisions: (a) no change desired, (b) decrease 0.1 per cent tolerance segment of the band, and (c) eliminate 0.1 per cent tolerance altogether. All these replies were then directed to the FCC for analysis.

On March 30th a letter was received from the FCC giving the results of their review and explaining why a change did not appear advisable at the present time. We quote from this letter as follows:

From an analysis of the survey, a table which is shown below, has been prepared showing the opinions of certain persons connected with licensed stations in the War Emergency Radio Service. Letters from persons not connected with licensed stations, although taken into consideration, were not counted in the compilation of this table.

	Licensee Represented	Total No. of Units Licensed	Avg. No. of Units/Licensee
No change desired.....	12	421	35.1
Decrease 0.1% tolerance segment of band.....	16	274	17.1
Eliminate 0.1% tolerance	47	929	19.8
Total.....	75		

Data contained in this table appear to indicate that the larger licensees (larger number of units) are in favor of the regulations governing frequency tolerances as now set forth in Section 15.25 of the Commission's rules. Also, several of these licensees are located in the congested districts of Boston, New York and Philadelphia, although several radio aides of licensees in these areas are in favor of relaxation of the tolerances.

A further study of the letters reveals that, in general, only those persons desiring no change in present regulations have set forth detailed reasons therefor. These reasons may be condensed to "interference would increase with relaxation of the tolerances." The argument in favor of less strict frequency tolerances is that transceivers and modulated oscillators are not capable of a frequency tolerance of 0.1% (Abbott Model TR-4 is a modulated oscillator and has a frequency tolerance of 0.1%) and that equipment capable of the 0.1% tolerance is not available to War Emergency Radio Service at the present time.

Although the greater number of responses to the survey indicates that the elimination of the 0.1% tolerance would be desirable, those responses from persons connected with civilian defense station licensees in congested areas contain excellent reasons for maintaining Section 15.25 in its present form. In view of the foregoing, it does not appear advisable for our Engineering Department to initiate any change in frequency tolerance requirements at this time. Your suggestion of eliminating the 0.1% frequency tolerance in favor

of power restrictions of 3 to 5 watts does not appear to be advisable since long distance transmission possibilities even at this low power is indicated by the fact that the Commission has received reports of repeater stations operating on frequencies in the neighborhood of 116,000 kilocycles with a power not in excess of 3 watts giving continuous service over a distance of 120 miles.

Should the Commission receive a formal request from a representative number of War Emergency Radio Service licensees, to modify the provisions of Section 15.25, such request would be given due consideration. A compromise suggestion might be to limit the 0.1% tolerance requirement to the band 112 to 113 megacycles only, which would provide about the same number of assignable channels for stations of each type.

The League has deemed it advisable to request the compromise suggestion, and a proposal to the FCC is now "in the works." Further results will be reported to you in this column.

**WERS Licensee Total Mounts.** One of the most encouraging items that comes to our desk periodically is the report from the FCC on the existing number of WERS licensees. The number is continually on the increase, and we are happy to state that, as of March 31, 1944, there were 261 CD-WERS licensees, 14 CAP-WERS licensees and 11 SG-WERS licensees. This summary also shows that WERS has been licensed in two new states. Nice going!

**Stay In Your Own Back Yard.** It's hard to know whether to attribute it to the weather or to the acquisition of extra gas ration coupons in some places, but the sudden increase in letters from licensees asking for "interpretation of the regulations concerning the permissible area to be covered by portable-mobile units" seems to indicate that the birds are not alone in experiencing the spring migratory instinct.

Just as a refresher, we'll repeat that roving outside of licensed areas and participation in networks of other licensees by portable-mobile units is to be discouraged. Although the regulations do not specifically limit the geographic area from which transmissions may be made, this type of inter-licensee communication is to be considered only when the radio aides of both licensees have agreed to it, and when some specific mutual aid will be rendered to the communities involved, as a result. A glance at October, 1943, *QST*, page 65, and ARRL's July 16, 1943, bulletin, page 3, will give further enlightenment on the subject.

**Re: Amendment of Restricted Order No. 2.** Because complete texts of the amendments to the instructions in connection with Restricted Order No. 2 are classed as "restricted" information, and cannot be treated in this column, we shall have to limit our comments on Restricted Order No. 2-B to the following notice received recently from the FCC:

"Monitoring of the Key Stations and other activities of the Commission's licensees in connection with the air-raided warning program will continue as at present unless a notification is received to the contrary from appropriate Fighter Commands."

#### SCM Elections and Nominating Petitions.

If you are residing in any of the following sections — Hawaii, Sacramento Valley, Nevada, Oklahoma, Alaska, Southern Minnesota, New Hampshire, West Indies, Maine, South Carolina or Western Florida — won't you take a look at the column headed "Election Notices," in this department of *QST*, before you read any further? Think of some amateur in your section who would do a good job of reporting activities of your section to *QST* once a month, making sure of course that he has been a licensed amateur operator for at least two years and a full member of the League for at least one continuous year — immediately prior to his nomination — and circulate his name around until you can get five signers who are full members of the League in good standing. Then send the petition in to us by June 15th, and we'll do the rest!

We've received some petitions from members of these sections, but they have all been declared invalid because either the candidate or the signers have not met the full requirements. Other sections in this group have not been heard from for many a moon, and it's kinda hard to explain to the other members of those sections, who write us from places like the Anzio beachhead and New Guinea, that the local gang are "too busy" to let him know — through *QST*'s pages — what's going on back home and elsewhere with the old bunch. SCM duties are far fewer now than they used to be in the old days, when we were all on the air, so it shouldn't work a hardship on very many to gather up a little news once a month to send in to *QST*. To quote from a letter recently received from an Army captain, a W5, now stationed at Anzio: "Would like for you to awaken some of the hams in — to the fact that we would like to have some news from those still there and those in the services. One of these days we'll be home and ready to get back on the air, but we're depending on those at home to keep working to that end while we are away!"

Need more be said, gang? How about it?

— C. K. W.

#### BRIEFS

Looking for a way to pep up lagging interest in your local WERS net? Some of the members of WJQM of Haverford Township, Pa., who are also photography enthusiasts, have struck upon a novel idea to create enthusiasm among participating personnel and to instruct outsiders in an entertaining way concerning activities of the community WERS network. They have taken moving pictures of the net in action, which will serve as an indelible record of the service of the group to the community and will be an extremely effective "propaganda" device for the purposes mentioned above. Sounds like it's worth a try, gang!

Albert H. Buch, W8AMS, would like to know if anyone can better his record of having his radio equipment located in the same house and in the same room since July, 1919.

#### ELECTION NOTICES

To all ARRL Members residing in the Sections listed below:

The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office. This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from ARRL full members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from full Members of a Section, the incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the filing of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in West Hartford on or before noon on the dates specified.

Due to a resignation in the San Joaquin Valley Section, nominating petitions are hereby solicited for the office of Section Communications Manager in this Section, and the closing date for receipt of nominations at ARRL Headquarters is herewith specified as noon, Thursday, June 15, 1944.

Section	Closing Date	Present SCM	Present Term of Office Ends
South Dakota	May 15, 1944	P. H. Schultz	May 18, 1944
Alabama	May 15, 1944	Lawrence Smyth	May 22, 1944
Iowa	May 15, 1944	Arthur E. Rydberg	May 26, 1944
Montana	May 15, 1944	R. Rex Roberts	June 1, 1944
San Joaquin Valley	June 15, 1944	Antone J. Silva (resigned)	.....
Hawaii	June 15, 1944	Francis T. Blatt	Feb. 28, 1941
Sacramento Valley	June 15, 1944	Vincent N. Feldhausen	June 15, 1941
Nevada	June 15, 1944	Edward W. Heim	Nov. 1, 1941
Oklahoma	June 15, 1944	R. W. Batter	Nov. 1, 1941
Alaska	June 15, 1944	James G. Sherry	June 14, 1942
Southern Minn.	June 15, 1944	Millard L. Bender	Aug. 22, 1942
New Hampshire	June 15, 1944	Mrs. Dorothy W. Evans	Sept. 1, 1942
West Indies	June 15, 1944	Mario de la Torre	Dec. 1, 1942
Maine	June 15, 1944	Ames R. Millett	June 7, 1943
South Carolina	June 15, 1944	Ted Ferguson	Aug. 25, 1943
Western Fla.	June 15, 1944	Oscar Cederstrom	Oct. 1, 1943
Idaho	June 15, 1944	Don D. Oberbillig	April 15, 1944
Los Angeles	June 15, 1944	H. F. Wood	July 1, 1944
Illinois	July 3, 1944	Mrs. Carrie Jones	July 11, 1944
Arkansas	Aug. 1, 1944	Edgar Beck	Aug. 17, 1944
North Dakota	Aug. 1, 1944	John McBride	Aug. 17, 1944
Western Mass.	Aug. 1, 1944	William J. Barrett	Aug. 17, 1944
Ohio	Aug. 1, 1944	D. C. McCoy	Aug. 17, 1944
Wisconsin	Aug. 1, 1944	Emil Felber, Jr.	Aug. 17, 1944

1. You are hereby notified that an election for an ARRL Section Communications Manager for the next two-year term of office is about to be held in each of these Sections in accordance with the provisions of the By-Laws.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The Ballots mailed from Headquarters will list in alphabetical sequence the names of all eligible candidates nominated for the position by ARRL full members residing in the Sections concerned. Ballots will be mailed to full members as of the closing dates specified above, for receipt of nominating petitions.

3. Nominating petitions from the Sections named are hereby solicited. Five or more ARRL full members residing in any Section have the privilege of nominating any full member of the League as candidate for Section Manager. The following form for nomination is suggested:

(Place and date)

Communications Manager, ARRL

38 La Salle Road, West Hartford, Conn.

We, the undersigned full members of the ARRL residing in the ..... Section of the ..... Division hereby nominate ..... as candidate for Section Communications Manager for this Section for the next two-year term of office.

(Five or more signatures of ARRL full members are required) The candidates and five or more signers must be League full members in good standing or the petition will be thrown out as invalid. Each candidate must have been a licensed amateur operator for at least two years and similarly, a full member of the League for at least one continuous year, immediately prior to his nomination or the petition will likewise be invalidated. The complete name, address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit to the number of petitions that may be filed, but no member shall sign more than one.

4. Members are urged to take initiative immediately, filing petitions for the officials of each Section listed above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

— Carol K. Witte, Acting Communications Manager

#### ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections, as provided in our Constitution and By-Laws, electing the following officials, the term of office starting on the date given.

Eastern Mass.	Frank L. Baker, Jr., W1ALP	April 2, 1944
San Diego	Ralph H. Culbertson, W6CHV	April 15, 1944
Missouri	Letha A. Dangerfield, W9OUD	April 17, 1944
Colorado	H. F. Heikel, W9VGC	April 17, 1944

# WERS of the Month

## Chicago, Illinois

Each month under the above heading we shall publish the story of an outstanding WERS organization as an item of general interest to all WERS participants. Contributions are solicited from any radio aide or WERS participant, whether he be an amateur or a WERS permittee. Descriptions of organizations which have already been featured in QST articles will not be considered. The story may describe the organization in general, how it came into being, how it was set up and how it operates; or it may describe some particular phase of the organization which makes it unusual or unique. Contributions should be brief (two or three typewritten pages, double-spaced, is maximum) and may include photographs if desired, although only one photograph will be printed with each story. Each story must be released for publication by the radio aide of the licensee, in writing. Address your contribution to the Communications Department, ARRL, and mark it: "For WERS of the Month."

**T**HE War Emergency Radio Service was officially established in the Chicago metropolitan area in October, 1942, by executive order of Mayor Edward J. Kelly, U. S. coordinator, assisted by Philip Harrington, director of communications, and F. D. Wyatt, who had been appointed director of radio communications for the area.

To begin with, a questionnaire was sent out to all amateurs within the area, which was divided into fourteen divisions. A division radio aide was then chosen in each, as follows, to complete the WERS staff: F. D. Wyatt, director of radio communications; D. E. Blake, W9NWX, assistant director of radio communications; division radio aides: W9KBO, South Area; W9TXU, West Area; W9FXB, North Area; W9JBH, Div. 8; W9LXD, Div. 9; W9RLW, Div. 10; W9UEU, Div. 11; W9KJW, Div. 12; W9PNV, W9PEQ and W9FCN, Div. 13. Arrangements were then made to hold meetings of this group twice a month, for discussion and compilation of information relative to establishing the WERS network.

The division radio aides then contacted individuals in their divisions who, in response to the original questionnaire, had offered either services or equipment for this work. Committees were then formed in each division to deal with the various phases of organization and operation.



A view of the main control station, WHHI-1, with W9NWX shown making a routine check-up.

After the expenditure of considerable time and effort in lining up available equipment and in completing the necessary forms, the application was submitted to the FCC. In June, 1943, a WERS license was granted to the City of Chicago, with the assigned call letters of WHHI.

Plans of operation were then drawn up to enable each division control station and its associated units to operate without interference from other division nets nearby, and to communicate simultaneously with the main control station. This resulted in each division radio aide having his own organizational staff, which includes such men as the deputy division radio aide, chief operator, chief technician, and other assistants in charge of training operators and building and maintaining the equipment. Directed test periods of two hours each are held three times weekly, and of course there is active participation in all OCD communication tests and blackouts.

The primary purpose of the WERS in Chicago is to furnish communication from the community report centers to the control centers, and from the control centers to the main control center of the OCD system. Radio will be used as a supplementary means of communication in an emergency, and as a means to dispatch orders to the various services within the divisions to expedite aid and repair crews to the scenes of incidents.

WHHI is now serving the eastern part of Lake and Du Page counties and all of Cook County. This area covers approximately 1,021 square miles and contains a population of almost five million people. Prior to the war there were about 3,500 amateurs within this area alone, but many of these are now serving all over the world in the armed forces. The few amateurs remaining in the area have enthusiastically taken up the torch in WERS activities, and have responded in the organization and operation of the local network in a truly creditable and praiseworthy fashion.

—David E. Blake, W9NWX,

Asst. Director of Radio Communications, WHHI.



Among those enjoying the Bay Area Hamfest held March 18th at the Hotel Whitcomb in San Francisco, Calif., were, left to right, Arthur Kellogg, W6MZ; John Babcock, W6ZA, and Art Arrigoni, W6WN. In spite of wartime difficulties, 180 hamfesters gathered for the affair, which featured a chicken dinner, ample opportunity for rag-chewing, and a special program including a down-to-earth talk by Dr. Karl Spangenberg of Stanford University concerning the use and application of wave guides and a showing of the Navy's heretofore restricted film of the Japanese attack on Pearl Harbor. Amateurs from all sections of the country now in the services and stationed in the Bay area were present, all branches of the armed forces being well represented. Heading the committee for the hamfest was Hal Ayres, W6NGV, and working with him were Lt. T. J. De La-saux, USN; Dave Bigley, W6AEX; Ed Sargent, ex-W6FC; Bill Ladley, W6RVQ; Ernie Brown, W6KNZ; Pacific Division Director McCargar, W6EY; Gene Pera, W6DOT; Sam Van Liew, W6CVP, and Sandy Sander-son, W6IUZ.



Radio Aide Kenney, W2BGO, explains the purposes and function of WERS, while Lt. Cmdr. E. M. Peckenhough, asst. district officer of the Third Naval District; Lt. Col. H. P. Kirkham, OCD; Major Theo. Borgman, asst. signal officer of the First Fighter Command; Major L. Silverberg, regional protection officer of the Office of Civilian Defense; Acting Deputy Fire Chief R. J. Comiskey, and Deputy Inspector F. A. Burns, superintendent of the Police Telegraph Bureau, look on.

Photos by John Neva, member of WNYJ.

## WNYJ Stages City-Wide Demonstration

ON SUNDAY, April 16th, the members of WNYJ exhibited their radio equipment and explained WERS to officials of the Army, Navy, OCD, municipal fire and police departments, and other interested individuals. Despite the rainy weather the demonstration proved highly successful, as judged by the favorable comment made by officials and onlookers.

The ceremonies were opened by the playing of "The Star Spangled Banner," after which the radio aide, Vincent Kenney, W2BGO, explained the purpose and functions of WERS. The assembled guests were then invited to inspect the equipment on display, which consisted of 51 portable-mobile units in automobiles and about 60 handie-talkie and walkie-talkie units. During this inspection the WERS operators explained how they had constructed the units from discarded radio parts, scrap metal, etc., not of use in the war effort.

After the inspection each of the officials present said a few words in praise of the aims and achievements of the organization. This part of the program was followed by the public award of service-ribbons to each of the borough coordinators, who later distributed them to members of their groups who had completed from 500 to 3,000 hours in WERS work.

Inspector Arthur W. Wallendar, chief of staff of the city's defense forces, then administered the FCC oath of secrecy to all the members of the WERS. As is shown in the accompanying picture, many of these raised their right hand for the oath while they clutched handie-talkie or walkie-talkie rigs in their left.

Following this ceremony, Radio Aide Kenney led the entire group to the main control station, located in a downtown Manhattan building, where a further explanation of the WERS set-up and procedure was made. A practical demonstration was given when a practice alert was sounded. Mobile units were dispatched to the scenes of simulated incidents, and the guests at the control center were able to watch the compilation of information on the availability of emergency groups, the extent of destruction at various places and the existing condition of hospital facilities and transportation.

After the test the mobile units were called back to the main control station and guests were given rides in the cars, so that they could observe the mobile units in actual operation.



Officials and guests inspecting the WNYJ portable units and handie-talkies on display.



New York City WERS members being sworn to secrecy by Inspector A. W. Wallendar, chief of staff of the city's defense forces.

## The Month in Canada

### QUEBEC—VE2

From Lt. L. G. Morris, VE2CO:

JACK LITTLE, 2HP, was in Ottawa for a few days and looked up 2DR, 2EE and 2CO. 2HP is doing radio work along with Sid Walker, 2FQ, at No. 9 Air Observer School, St. Jean, P. Q.

2CO had a long rag-chew with Sgt. F. C. Turner, G3VI, an RAF wireless air gunner temporarily stationed at the RCAF Manning Pool, Lachine, P. Q. Turner spent several days' leave in Ottawa and was anxious to meet some of the VEs he had worked before the war.

It is with the deepest regret that we report that Gordon Wright, VE2MV, of Montreal West is listed as missing and presumed dead. 2MV, a sub-lieutenant in the RCNVR, will be remembered as one of the district's leading operators.

### ONTARIO—VE3

From Leonard W. Mitchell, VE3AZ:

CPL. CAM BURROWS, 3AGC, who was overseas with the RCCS, was wounded in Sicily after having seen service in England, Africa and Sicily. He now is home and after a month's furlough expects to return to a military hospital in London, Ont. While in Detroit recently he called on W8NNZ, who is coming along fine after a serious accident some months ago. While in England, 3AGC attended a couple of hamfests and met many VEs and Gs, including G2YL who was well known on 14-Mc. 'phone and G6ZO who was well known on 14 Mc. G6ZO now is serving in the Middle East. VU7BR also was in attendance at one of these hamfests and the inevitable rag-chewing by the hams on various subjects kept things going until it was time for tea and cakes.

3CU is still doing service work. 3HP is still in charge of the Hydro station at Burlington. 3LB is building an odd receiver. 3AQB is with the brewery and building a receiver in his spare time, while 9AT is still running the local b.c. station, CFCCO.

# AMATEUR ACTIVITIES

## ATLANTIC DIVISION

**EASTERN PENNSYLVANIA**—SCM, Jerry Mathis, W3BES—The Phila. WERS conducted interesting tests with their fire department, proving that their 112-Mc. rigs could work out of the subways. 3JBC was home on his last furlough before being shipped out. 3CZM joined the Navy as RM3c. Recent V-mail letters attest that 3GYV is still safe in Italy. He wants to build a midget battery receiver if he can get the parts. 3GHM is making progress at Camp Crowder, Mo. He was placed in the telephone section despite the fact that he was itching to do some brasspounding. The Frankford Club set up an intercommunications system for code practise in order to keep from going stale on code and procedure. At the last meeting they ran a novel diagram drawing contest, which was won by 3DVC. 3ITZ of the West Philly Radio Association wants to know if the leaders of the various clubs would like to get together with him for some postwar planning. Among the items to be discussed is the prospect of running joint hamfests. 3HQE is now a lieutenant commander in the Navy. Keep the reports coming in. Thanks, 73, Jerry.

**MARYLAND-DELAWARE-DISTRICT OF COLUMBIA**—SCM, Hermann E. Hobbs, W3CIZ—No reports or information on ham activities were received this month. The Navy Department is looking for amateur operators.

**SOUTHERN NEW JERSEY**—SCM, Ray Tomlinson, W3GCU—Asst. SCM, Ed. G. Raser, W3ZI. Regional EC for So. N. J., Technical Radio Advisor for N. J. State Defense Council, N. J. State Radio Aide for WERS and Radio Aide for Hamilton Twp. WERS, ASQ, EC for Somerville and vicinity, including Southbranch, and Radio Aide for Hillsboro/Branchburg Twps. WERS, ABS. Hamilton Twp. WERS reports through Radio Aide ASQ that some new operator permits have been forthcoming from FCC and their recipients are ready to go to work. Several new rigs of the transmitter-receiver type are ready to be placed in service as soon as license amendments permit. AXU has submitted his application for WERS operator permit, which will enable him to participate in our Hamilton Twp. WERS project. We are very happy to welcome back to our district Major Silverborg, who has offered his services to anyone who wishes clarification of WERS. The radio aide for Hillsboro/Branchburg Twps., ABS, reports another unit completed and in service, bringing to nine the active units there and, with six more restricted 'phone licensees receiving their WERS permits being added to their net, they plan very active spring and summer drills. Planned incidents with the eight fire companies in their licensed area are anticipated. Stan reports the use of a new ground plane radial coaxial-fed mobile antenna on their mobile units No. 3 and 9, which lays down a tremendous signal and can be heard with excellent signal strength a distance of 30 miles. The new superhet receiver has been completed and is now being used at control. This brings to three the number of supers now in service with this program. It is planned to redesign the set-up and file for amendment of license to include the improvements. N. J. State Aide ASQ reports that Bridge-water Twp. received authority from FCC to operate WERS in that municipality under the call WJMN; this project includes three fixed units and five mobile units. This license has been in effect since Mar. 6th. Several batteries from the WERS stock at headquarters in Trenton have been shipped to Westville and other WERS projects throughout the State. CCO, former So. N. J. SCM, now a Lt. in the Signal Corps, has been transferred to the inactive Reserve following injuries received while at Ft. Monmouth. Les expects his final orders, which will place him back in civilian life again, within the next few weeks. Here is the latest list of known addresses of men in the services: *Army*: Major Samuel S. Kale, W3VE, APO 255, c/o Postmaster, N. Y. C.; Lt. Norman Botteroff, W3HTL, OCS School, Ft. Monmouth, N. J.; Lt. Ray Whitley, jr., W3FMU, Air Corps, Luke Field, Phoenix, Ariz.; M/Sgt. Robt. Lanzoni, W3FBC, Signal Corps, AEF, Ireland; T/Sgt. Wm. F. Petty, jr., W3HAZ, Hq. Co. 803, Sig. Tng. Regt., Ft. Monmouth, N. J.; T/Sgt. Stephen Jesso, W3CFT, APO 258, c/o Postmas-

ter, San Francisco, Calif.; T/3 Wm. Bryce, APO 512, c/o Postmaster, N. Y.; Cpl. Arthur G. Hassal, APO 760, c/o Postmaster, N. Y.; Cpl. Steven Czorgo, AAF, 636th Tech. School Sqdn., Barracks 760, Boca Ratan Field, Fla.; Cpl. David Nabutovsky, W3ITU, Hq. Bty., 3rd C. A., Ft. MacArthur, San Pedro, Calif.; Cpl. Carl Miller, Co. X, 800th Sig. Tng. Regt., Camp Crowder, Mo.; M/Sgt. A. Constantino, W3IOW, APO 832, c/o Postmaster, New Orleans, La. *Navy*: Ens. John Orłowski, W3BMM, Travers, Mich.; W/O Willard H. Carson, W3GLG, somewhere on eastern sea frontier; CRM Ed B. Kerr, W3CCC, Naval D. F. Stn., Amagansette, L. I., N. Y.; Anthony S. Rura, W3ARN, RT1c, Staff RMS Naval Research Labs., Washington, D. C.; Wm. Latham, W3HPE, RT1c, Naval Operations Base, Norfolk, Va.; Wesley Armstrong, W3GEV, EM1c, c/o Fleet Post Office, San Francisco, Calif.; E. M. Podgorski, W3HTP, RM3c, Box 30, Naval Air Stn., Jacksonville, Fla.; Edward A. Peters, jr., LSPH, Slc, c/o Fleet Post Office, San Francisco, Calif. *Coast Guard*: John P. Ogelby, RT2c, Repair Yard, USCGR, Edge Moor, Del. *Marine Corps*: M/T Sgt. R. D. Reed, W3ATF, USMCR, Navy 250, c/o Fleet Post Office, San Francisco, Calif. *Merchant Marine*: Ens. Paul Solomon, W3GRW, Chief Radio Operator, Clyde Mallory Lines, N. Y. C.; Walter S. Scott, W3HOJ, RT1c, c/o Fleet Post Office, San Francisco, Calif. Attention, Pfc. Walter J. Reis, 668th Navigation Tng. Sqdn., Ellington Field, Tex.: VX's address is: C. H. Jenkins, 129 Oak St., Westville, N. J. He is chairman of communications for Westville, N. J., and has been actively engaged in WERS for the past year. ZJ's son, Ed jr., has been transferred to advanced school in E.E. at Cornell U. After completing his course he will enter cadet school and hopes to gain a commission in the Navy. HKO has recently returned from special duty in Alaskan territory. AFA will seek employment at Eastern Aircraft in Trenton, or Budd Mfg. Co., Phila. On April 21st the Delaware Valley Radio Association held its twelfth annual installation dinner and open house, at which the guest speaker was A. D. Middleton, recently returned from a tour of Alaskan duty. Mr. Middleton is one of the pioneer radio engineers and gave a very interesting talk. Also honored at this dinner was 3ITU, radio operator stationed at Ft. MacArthur, San Pedro, now home on a well-earned leave. EC certificates of ASQ and ABS have been endorsed for another year. 73.

**WESTERN NEW YORK**—SCM, William Bellor, W8MC—The WERS network for the County of Monroe and City of Rochester is now on the air under the call WHNH, with 18 units. DFN built the control station, a beautiful crystal-controlled job using an 829 with plate and screen modulation in the final. The concentric-fed antenna and the control station are located in the tower of the Lincoln-Alliance Bank Building in Rochester. Signals of the initial test period were reported past Syracuse, N. Y., over 90 miles away. The boys feel that a relay link between Rochester and Syracuse, which would be a long step in developing a state-wide network, might well be possible. Plans are now being worked on between the boys of WKBS and WHNH. The Rochester Amateur Radio Association has decided to meet once a month at the Powers Hotel. Since reactivation attendance at meetings has been good. TWX, with the Army Air Forces in Fresno, Calif. sends in a nice letter. Bill is in radar work and threatens to show the boys quite a few new tricks when the big fracas is over. Jim Lee writes from Camp Campbell that he met an old 20-meter contact, K5AT, in camp. Jim says he met RCJ when he was home in Feb. as a result of our mentioning in this column that he wanted to hear from him. RQX is again back in Rochester at his old job as operator at WHEC. We hear that the Syracuse and Utica WERS groups have established contact between their cities. 73, Bill.

## CENTRAL DIVISION

**ILLINOIS**—Acting SCM, George Keith, jr., W9QLZ—Major OXA is now stationed at Albuquerque, N. Mex., where he is brushing up on Liberators. Jack recently paid a visit to Streator via a B-24 and while there found time to dip his wings over the TAY mast. TAY wishes he had stocked up on tubes way back in 1940. ZEN has been advanced to RM1c and is losing no weight. ZZU passes along the following news from somewhere in Australia, "Credit should be given to ENY of Alton, Ill., who some time ago was among the submarine crew that took a beating from depth charges for 38 hours. They were very near the end of their battery life and oxygen supply when they brought their ship back to port." Ernie would like to hear from KRK,

SHP and RLH. Address: Ernest T. Rosing, RM2c, Submarine Division 162, c/o Fleet Post Office, San Francisco. HVA has been very busy with farm work since Pearl Harbor and is getting the urge to get back on 40- and 80-meter c.w. ALU is in the Pacific area dreaming up new circuits for postwar radio. With his *Handbook* by his side, Hod plans to assemble a receiver around some IT4 tubes and sockets supplied by ERE. ALU met a W7 with some well-worn issues of *QST* and says, "Keep the Illinois section news going. It brings back a lot of pleasant memories of old friends." The Starved Rock Radio Club has passed ten years of affiliation with the ARRL and it is hoped that another ten years finds SRRC able to celebrate appropriately. WWP became the XYL of 8VKJ/9UPG on April 8th. 73, *Geo*.

INDIANA — SCM, Herbert S. Brier, W9EGQ — PQL still operates on an Army transport out of Seattle. CWY is in Italy as a radio operator with an Armored Signal Company. RT2c CTK is located in the So. Pacific where the weather gets warmer than somewhat. FOS now has an APO address. WIB got married while home on leave. He saw PBS while "getting the hitching permit." He is RM1c, located in the So. Pacific. EHT is getting gunnery training in the Navy. KMY was home on furlough recently. The Ft. Wayne WERS continues active. They are now having more "big" tests and fewer routine tests. After the war, no matter what happens to WERS, a liaison between hams and the city Signal Department will be continued. Radio Aide UDD sent three diagrams that they find very efficient on 2½ meters. They were printed in the April *Bison*. EGV spends what little spare time he has gloating over the 40-miles-per-gallon he gets from his Austin. ILU has a jr. operator. EGV and SVH continue their feud. Doc offers to teach John the code if John will teach him Spanish. DEE is an air cadet at Seymour Johnson Field, N. C. HUV accuses me of developing into a jr. Walter Winchell, and threatens to wring my neck. DGA is communications chief with his outfit in Egypt. YGA, Highland radio aide, is preparing a class for restricted radiotelephone exam. He would like to know IMX's address. EOC thinks that the power limit should remain as it is. Radio Aide MVZ and Assistant Radio Aide MTL of Gary, attended a meeting of Chicago radio aides. Gary and Chicago WERS hold a regular schedule. YMV is 1st assistant radio operator on a ship. IIL continues his sojourn in the Florida swamps for the Army. UYP flight-tested the famous plane "Hell's Angel." He sneaked his call on the fuselage. He says it is well worth buying a War Bond to see the plane. EBB is traveling for the Naval Lab. SNF is again in Sioux Falls. He teaches radio procedure to the Air Corps part of the day, and takes a radio mechanics course the rest of the day. AB reports that Mishawaka has its first YL WERS operator. He built a unit to fit the glove compartment of his car that is really rigid. Please drop me a card or letter with a little news. 73, *Herb*.

KENTUCKY — SCM, Darrell A. Downard, W9ARU — This section is back in print after somewhat of a lull because of too much railroading on the part of the SCM. This report is credited to DFW. If you fellows will report, we will continue to be in print. The ham personnel of Thermex, a division of the Girdler Corporation, headed by QKA, BUE and HCD, gave a demonstration of Thermex equipment at the last ARTS meeting. The 300-kw. oscillators are hot stuff. The ARTS attendance is holding its own in spite of vacancies caused by Uncle Sam. Maybe it's SFD's monthly jokes that bring 'em in. The Louisville WERS net copies lightning as well as 'phone signals. Ask GOM what happened to his hair. OEE, in the merchant marine, when last heard of was somewhere in the Pacific. URG just finished an RAF radio course in England. MRF got such a good-looking GI haircut Uncle Sam couldn't let him waste it. Giles Allen and Jerry Hollinsseed are leaving soon. Giles says his radio experience got him "took." ACD, a lieutenant in the Signal Corps, is now overseas. The SCM would appreciate hearing from any of the gang in the armed forces reading this report, and would like to correspond with them. Maybe after it's over KYN will be an international net — who knows?

MICHIGAN — SCM, Harold C. Bird, W8DPE — 8MV, who is now located at an eastern Army radio station, reports that everything is going nicely and that he has his wife with him. 8UGR sends us his card. He is sending in receiver and transmitting articles, together with a postwar emergency story. The DARA is holding regular meetings with many discussions on postwar plans and equipment. A recent meeting featured a pot-luck supper at the home of 8RX. 8BIU reports that Center Line is holding regular tests with WERS equipment and is planning to equip the

fire department with a two-way set; also plans are being made for walkie-talkie equipment. Ray reports excellent cooperation between the WERS volunteers and the city officials. Brockaway, secretary of the Edison Radio Club, sent a card inviting us to their meeting. We are sorry we could not attend because of our school. 8GP is doing nice work as secretary for the DARA and reports his other activities are very good. SDYH is fixing radios when he is not holding meetings of the various clubs of which he is president. 8UOI is looking forward to the summer weather. No reports on WERS were received from Lansing, Grand Rapids, Detroit, Flint or Muskegon. Members of the City of Pontiac WERS organization are doing very nicely with their radio school. Three weeks ago 19 took the restricted 'phone exam so they could qualify as WERS operators. Last Mon. night a very interesting discussion was held on the first part of elementary electricity, which the boys are now studying to enable them to get even higher grades of licenses. 8IFT reports that the equipment of the Red Cross club has been registered and the club is patiently awaiting the time when it can go on the air again. SDK has left for the West Coast and says it's going to be his permanent home. 8UXS is putting in a couple of days a week at the State Police station at the control point. 8IHR reports from Camp Crowder. His address is: Pvt. A. Anderson, Co. B, 36th Bn., Bks. 1100, Camp Crowder, Mo. Lt. 8RTN, located at Ft. Monmouth, N. J., is taking an advanced communications course. He reports that hams from all parts of the country are there with him. Lt. Julius Hoffer writes that he has not had much success in meeting any of the Michigan gang down there. Lots of W5s there, however. Judy would like the addresses of 8SLJ and 8VKU. His address is: Lt. Julius M. Hoffer. AAFTC, Yale University, New Haven, Conn. 7FWU sends in a suggestion to DARA, that to be eligible for SCM appointment a nominee should hold a proficiency certificate for 25 w.p.m. If you want more dope in this column it will have to come from you. So how about it? 73, and lots of luck, *Hal*.

OHIO — SCM, D. C. McCoy, W8CBI — *Cincinnati*: MFP reports the Queen City Emergency net activities have taken a decided upturn. Attendance at meetings has increased several hundred per cent in spite of gasoline rationing. Many new club members and members for the ARRL have been secured. The *Listening Post*, official publication of the QCEN, continues to flourish with PNQ as editor-in-chief. The last two issues contained several excellent technical articles along with other interesting items. Interest is developing in wired wireless. The WERS group is busily working with the Red Cross as well as civilian defense. On March 26th an unannounced test was conducted for the Red Cross and proved very successful. *Columbus*: QQ reports that some thought is being given to increasing the number of WERS portable-mobile units. AV and APO, the former a colonel and the latter a major, are now serving in the China-Burma-India theater. *Springfield*: EQN reports that JHR is back on his mail route after a year in the Army. PGO was home for a few days' furlough; he has been serving as radio operator on a bomber. EQN's son is back in Hawaii after serving in the Gilbert Islands campaign. To date EQN is the only EC in Ohio who has turned in his EC certificate for renewal. TIM has returned from Greenland and is now a s/sgt. stationed at Patterson Field, Dayton, as a maintenance man. SXQ of Urbana is a sgt. now stationed in England. *Middletown*: DGU reports a shortage of HY75 tubes. Tests are being run on WERS equipment to improve operation of various units. *Zanesville*: OXG has been appointed EC for the Zanesville WERS area. Attempts are being made to organize WERS in this area. *Dayton*: Increased activity with the Red Cross is contemplated, the Red Cross having furnished a fine, new radio room in connection with new quarters provided for their disaster committee. Thirty-nine members of the WERS unit were recently awarded civilian defense service ribbons for 500 or more hours of service. Executive Director Paul Schenck gave an excellent talk on the value of WERS to the community, urging the personnel to continue their activity and pledging continued support from the defense council. AGR and the staff of No. 2 will soon be busy installing equipment in the new quarters. TOZ has moved to Godman Field, Ky., where he is a sgt. with the 2nd Comm. Squadron. MFV has been promoted to sgt. and still is stationed with the 3rd Comm. Squadron at Alamogordo, N. Mex. He was home recently for a furlough and saw his eight-months-old daughter for the first time. SVI is in New Guinea. ENH has enlisted in the Navy and is now at Great Lakes. SID has

bought an Abbott TR-4 for WERS operation. We regret to report the death of WMQ on Mar. 26th due to a sudden heart attack. Akron: NYY is still in Africa serving as a civilian radio operator. General: We regret to announce that Don Park will leave the Ohio State Defense Council very shortly and return to his duties with the telephone company. A plaque expressing appreciation of his services on behalf of the amateurs and WERS personnel of Ohio was presented to him in Columbus on April 4th. Don's active interest in WERS was largely responsible for the high state of perfection developed in Ohio. Due to the small percentage of replies received, it is doubtful if the proposed general meeting will be held. Definite decision will not be reached until a later date. 73, Dan.

WISCONSIN — SCM, Emil R. Felber, jr., W9RH — WMFI units 1, 5, 7, 8, 9 now are operating at their permanent location and have had contacts with all units operating. In the next few weeks the rest of the 19 units will be permanently located and in operation. Portable-mobile unit No. 13 has worked nearly all stations while in motion over a large area of the city. More mobile units are ready for testing. Sun. and Wed. tests are to continue until the complete network is in working order. GQO was a visitor at the MRAC. He is now in charge of the transmitting tube test department at Raytheon. SYT is with RCA here, too. He says he helps to install and repair sound apparatus in ships. May 25th will be the Milwaukee Radio Amateurs Club's last meeting until Sept. 7, 1944. DII attended the meeting. Pvt. John Holmes has been transferred to Illinois. Ed. J. Smith, ARM3c, is doing radio maintenance work in Tennessee. Robert O. Mayer is a radio operator with Northwest Airlines at Chicago. Ray P. Charney, S1c, is now in Australia. Lt. RRT is somewhere in Italy. Comdr. SZH is now at a Naval Air Station near Milwaukee. Radio Elect. T. C. Kercher, USN, ex-HWY, is located in England. Pfc. John Deisinger and Sgt. Bernard Kellner are in Fla. Pvt. Paul J. Ripple is in a railway operators' battalion in Texas. Pfc. Carl H. Schuppel sent three copies of the *Timberwolf* from Colorado. 1st Lt. VKC sent a V-mail letter from India. Sgt. James Fischer sent 73 via V-mail from England. Capt. FY V-mailed from a S.W. Pacific Island and said nice gear and location for ham station. Capt. JWT, USMCR, hopes to be home for a few days soon. T4 ANK has returned to the States and is located at Camp Crowder, Mo. Sgt. OEB, of Hayward, would like to hear from some of his Wisconsin friends. Write to me for his overseas address. 73, Emil.

#### DAKOTA DIVISION

SOUTH DAKOTA — SCM, P. H. Schultz, W9QVY — THEY — ex-9EXJ reports from Sioux Falls that there has been some talk of WERS at the Base there but the matter seems to have been dropped. Ken says he has his 1st-class radiotelephone license now. ZNM has moved from Ashley, N. D., and his new QTH is P. O. Box 237, Kodiak, Alaska. Why not drop ad a few lines? I'm sure he will answer your letters and I know he'd like to hear from you. He says OGT is up there with him. 73.

NORTHERN MINNESOTA — SCM, Armond D. Brattland, W9FUZ — HQX passed through St. Paul the other day bound for the Navy. He has been stationed at San Francisco with the FBI. UCA, located at Port of Columbus, Ohio, has a 1st-class rating in radar. DYH is in the Navy, having attended Corpus Christi radar school and earned the highest honors of his group. GNR is now located in Chicago, on special duties after having done some outstanding work at Wright Field. FUZ is aboard a ship as chief radio operator. His XYL keeps feeding the news for the column as well as being engaged as a nurse at one of the Los Angeles hospitals. The jr. operator informs us he is raising "homing" rabbits. Will someone enlighten us on this? YUN, regional technical inspector of the First Airways Communication Region, informs us that he finds former amateurs by far the best men in the system. He and ZWW should correspond. Jack, in the same outfit, sixth region, unburies his soul in expressing the wish that he might have some St. Paul hams to help him in his "field days." Remember, gang, the fun we use to have in the ARRL Field Days? Well, we old bald-headed individuals left behind will be expecting all you young squirts to carry on in the future; what with Uncle Sam's training and all. GWM is aerial radio operator in the Air Transport Command, enjoying his trip around the world. YEQ is in the Signal Corps and ORT reports that the Army has placed him in radio. He enjoys the sectional reports and good old QST. Ex-TED writes that he joined the Navy in '42 and is

rated as chief radio technician. He stresses Uncle Sam's good fortune in having the amateurs available and trained when the blow was struck. Everett Dale, formerly of the aviation cadets, and now back in the Army technical school, writes from Gardner Field, Calif., giving us information on some of the boys. JRI is a s/sgt. in the Marine Air Wing, So. Pacific. FUI is in the Signal Corps expecting overseas duty. LPL is at San Antonio as an aviation cadet. TKX is with NWA, Chicago. NCS holds his own in the Coast Guard in Hawaii. GVO is back in the store and has it looking bright and shiny again. MTH is optimistic about 2½ meters after the CAP-WERS tests. RPT has just completed his ham shack, having labeled it "inner sanctum" — not a ghost of a chance to operate. MTH and BHY have dutifully christened the joint. The "bald-headed yokel" spends additional time instructing in electrical refrigeration at Dunwoody. Keep the reports coming in, fellows. Send them to Uncle FUZ, 2802 So. Western Ave., Los Angeles 7, and I will forward them to BHY in St. Paul, who will consolidate. The best of luck and 73, Army.

#### DELTA DIVISION

LOUISIANA — SCM, Eugene H. Treadaway, W5DKR — Hi, gang. Sure happy to be back on the job and will be glad to hear from each and every one of you every month with some news for this column. DRF is at the Mayo Clinic, Rochester, Minn. We all wish him a speedy recovery. IPX is farming onions and hopes to overcome the shortage in this area. INN was a recent visitor in St. Joseph. JTH visited in Monroe recently. Ex-DOG is applying for renewal. JTT moved from Winnfield to Shreveport. ITS is still located at Winnfield. DXL is still in Italy. JET is in North Africa. IIG reports from Italy. JMK was reported missing over Germany. IVF completed a course at Ft. Monmouth and now is stationed in Florida with the Air Forces. GDB of El Dorado visited with HEJ and HEK before leaving for training in the Navy. HOS is waiting for the day when he can put the big rig on the air. IDK is busy building a new speech amplifier. After a recent illness AKJ is back on the road to recovery. HQY is a busy telephone man. BLQ now is located in West Monroe. IRO made a trip to Florida. FJW would appreciate news from the YLs. JEY is dreaming of a new streamlined rig. ASA reports from Selman Field. AKT visited Monroe recently. ITH, will you please get in touch with the Monroe gang. DWW, our ex-SCM, is responsible for most of this report, and I wish to thank him for all he has done for our section. ACY of Plaquemine wrote the SCM a swell letter. JHM is with the Aviation Corp. WT is a railroad operator. DNW is building some FB test equipment. AOZ is still a cop. CXQ has promised to report each month for the N. O. gang. ECO has been very active in WERS work. FHH is busy fixing watches and clocks. JW, ex-president of the NORC, is a district attorney in the Capitol City. GUK is fixing radios. EVS reports that EBB is now a lt. col. in Italy. GND can always be found in the main post office at N. O. IBL is RM1c aboard a sub. FPO is a captain in the CAP. FSX is studying radio. GDU turns out some FB woodwork. GRE is RT2c in the Coast Guard. GEK hopes to go into the ferry command. ZS is communications chief with OCD. HSH is with the Navy on the West Coast. KJE is doing part-time radio work. DKR is doing part-time work as a motion picture operator. Mr. J. D. Bloom, chief engineer for WWI, is head of WERS for N. O. ERV pounds brass to keep up on code. ADJ keeps the receiver in good shape. The SCM would like to hear from each one of the gang, so please take a little time and drop me a line. 73, Gene.

MISSISSIPPI — SCM, P. W. Clement, W5HAV — AQW, formerly of Amory, is now in the Navy and has charge of a radio station at the Naval Air Base near Atlanta. HMZ, His Majesty's Zebra, the old striped mule, is in the Navy now. He formerly operated at Corinth. Pfc. K. A. Neely, operator license only, is doing radio maintenance work in the AACS at Langley Field, Va. He was a student of GXO and took the exam on the day we entered the war. GUU, formerly of Greenville, is now a 2nd lt. in the Air Corps and is in charge of the ground school code and communications department at Malden Field, Mo. Al Kafoury, former ham and serviceman at Greenville, is now RT1c on sea duty for Uncle Sam. GPR is a captain in the Medical Corps, somewhere overseas. JGP spent a short leave at home and is now back at sea. I appreciate the letters I have received and would like to hear from more of you. Write us a post card or letter from wherever you are. 73.

## HUDSON DIVISION

**NEW YORK CITY AND LONG ISLAND — SCM,** E. L. Baunach, W2AZV — We have received inquiries about the lack of reports for this section. This was because very few or no reports were sent in to me. If you want to have your section represented in these columns you must mail reports in to me on the fifteenth of each month. WERS by BO: Since the first general meeting of N. Y. C. WERS was held Aug. 31, 1942, we have built up one of the finest WERS organizations in the U.S.A. As Brooklyn is the second largest borough we have a big job in covering the borough with stations and getting operators to man these stations. Our enrollment has been excellent with over 50 licensed operators and over 150 other enrollees who either have an FCC license as their background, or are going to classes so that exams at the FCC office can be taken for operator's licenses. There are 60 stations of three classes licensed in Brooklyn: Fixed-portable, portable-mobile, and walkie-talkie or pack sets. We feel that any emergency that arises in Brooklyn can be covered and communications service rendered. This has been proven in several ways with flight path exercises throughout Brooklyn during alerts and special exercises as called by the Army and city officials. Not only have civilian defense problems been coped with but the fire department knows that should the box circuits go out of service, communications between fire headquarters and any firehouse can be established by WERS with the use of portable-mobile units. WERS in Brooklyn has been called upon to go to other boroughs when emergency called for these units. While there seems to be a let-down of other civilian defense units we can definitely say that WERS is on the upswing throughout Brooklyn. This is due mainly to the untiring efforts of Radio Aide BGO and his cooperation at all times in all the boroughs has been the inspiration for all those interested in keeping N. Y. C. WERS ready for any emergency it may be called upon to cover. NYC is now at Miami, Fla., as flight radio officer with the PAA. Ex-CJJ is working with Sperry Gyroscope in Garden City. DOG is working with Major Silverberg getting WERS going in Suffolk County. LBI is assistant engineer with the Federal Tel. Co. Lt. (jg) AZM is communications officer in the Navy port director's office. KEZ is CRM in the same office. FOB and KJY report that they have had big doings in Australia during the past two years. ITN married a N. C. YL and now is living in Washington, D. C.

## MIDWEST DIVISION

**IOWA — SCM,** Arthur E. Rydberg, W9AED — JIH, EC for Cedar Rapids (Linn County), reports that business is picking up. Maybe the fact that they have a WERS license has something to do with it. They have done a bit of experimenting with antennas and find that hills haven't interfered with operations. So far they have used only horizontal antennas. Receiver parts haven't been easy to get and they have assembled several receivers from junk. They have given some examinations for the restricted 'phone permit and will give several more in a couple of weeks. Assistant EC WQQ passes along the following: The KGIL net consists of six units: No. 1, JIH; No. 2, FUB; No. 3, WQQ; No. 4, YDX; Nos. 5 and 6, Archie Gardner. The first contact was between No. 1 and No. 3 on Apr. 2, 1944. Interest is increasing rapidly and they hope to have 50 stations in operation in the future. YDX married a Navy inspector, Dorothy Hampel, Apr. 9th. UQQ is now mechanized for victory gardening. FUB has an 815 on 112 Mc. JIH puts an FB signal all over Cedar Rapids. The Des Moines (Polk Co.) WERS unit will soon be licensed. They have applications in for 14 operator permits and 12 transmitter units. AHP warms up his transmitter occasionally (dummy antenna of course). ZLV and KXW are in California grinding crystals for Uncle Sam. QQB is working as a civilian for the government installing radio equipment. IFX is in charge of the Iowa state police radio system and UQG is at KACD at Atlantic. SVI says there is not much activity in Davenport with the exception of CAP radio work. UGB is married and works in Dallas for North American Aviation as radio installation man. With the same firm are SAY as electrical inspector, and TGJ in the machine shop. Thanks for your letters, fellows, and let's hear from more of you. 73, Art.

**KANSAS — SCM,** Alvin B. Unruh, W9AWP — UXQ is now a lt. col. at the Army War College in Washington, D. C. QQI terminated his job as radio engineer at Boeing-Wichita to enter the armed forces. ABG is a m/sgt. in the Signal

Corps, and expects to see overseas service soon. BCY and DMF are now in the electrical-radio experimental lab of the Boeing Engineering Department. ZKA was in the hospital for an operation. FET will install transmitters for the OWI overseas. He was with KFBI and KGPZ. QQT, who is an assistant foreman in functional test lab at Boeing, has been instructing a code class for fellow employees who expect to be postwar hams. QEF finished Navy radio school at Farragut, and has been assigned to a "big boat." CVL is a USNR lt. with the Bureau of Ships in Washington, D. C., and says he would like to fire up the ole rig again. FRC is a colonel on special duty — latest rumors had him in London. MAE and LBB are teaching a code class twice a week in Kansas City. The class is sponsored by the Heart of America Radio Club, of which Lee O'Dell is president. MAE reports 8 or 10 people are ready for their exams. QVB, formerly a lt. on active duty with the CAP, returned home for a visit. He will enter the Navy. 73, Abie.

**MISSOURI — SCM,** Letha A. Dangerfield, W9OUD — Lt. Dave Goggio, ex-9GHD, of St. Louis, has been in the Aleutians for the past 9 months and would appreciate letters from his old friends. I will be glad to send his address to you. WAP has been at sea, operating with the merchant marine for 16 months. He was home for a short time and is off again as chief operator on a new Liberty ship. Doug Blick reports that LBB and MAE are teaching code classes under the sponsorship of the Heart of America Radio Club. OKJ attended a 7-week refresher course in Ft. Worth at the CAA Signal Training Center where he met a lot of hams. He says they always make a good showing in these courses. GCL has been transferred by the CAA to Cheyenne. TGN tells us that some time in Jan. the Naval ship on which he is chief operator was near the merchant vessel on which PYF is radio operator and the two had a brief QSO by blinker signal. TGN still hopes for a leave eventually. RHA has reached the half-way point in the pre-flight course at San Antonio, and if he passes will be ready for primary training. AEJ is operator 1st-class in the Navy now down on the Gulf Coast. KIK writes to say that VXV, radio aide for the St. Louis area, announced the WERS license renewal was received April 1st; there are 12 portable and 8 fixed stations under the call KFPJ. Remember your letters to me and to the boys in the services. GHD said what we have been hearing on all sides — the boys need more mail. Here is one suggestion: Please make those return addresses clear and legible. This is especially important for you fellows in the services, as we civilians are dumb about guessing at abbreviations, and so forth. 73 and the best of luck to all of you.

**NEBRASKA — SCM,** Roy E. Olmsted, W9POB — Bob Woerner, one of the Woerner brothers of FZX, now resides in N. Y. C. He possesses the call 2NKA and is working in restricted radio development for Western Electric. His brother, Otto, also a radio engineer, is working for RCA. HZC, formerly of Lincoln, sends special greetings to Burdett Hanson and J. R. Jewell of the trade school and reports that he is doing final radio inspection at a California aircraft plant. Ben adds that QMY is located at Shreveport and that MUK, who has been awarded the purple heart and silver star for service at Pearl Harbor and in the So. Pacific, is now stationed in Connecticut as an instructor. YOD has lost those seven long hairs worrying about his radio VO-ED class in Ogallala High School. Cpl. ZFC has just returned to McClelland Field after a furlough at Omaha and states that most of his ham friends are in the services or in war work. OHU now is stationed at Hayes Center with CAA, and YOP has returned to the States after a tour of duty in Alaska, installing radio stations for CAA. He brought home some good stories but nothing new on the Kee-bird. Pop.

## NEW ENGLAND DIVISION

**CONNECTICUT — SCM,** Edmund R. Fraser, W1KQY — APA is now in the Army. Gil was formerly president of BARA, EC for Bridgeport, OPS, OO and ORS. HMZ of West Haven is GB's 27th member to enter the armed services. JHN, chief boatswain's mate, USCG, was recently home on furlough. NAM is a 1st lt. in the Pacific area. Our deepest sympathy to LTB, whose mother recently passed away. 9AKN was a recent visitor at the QTH of LVH in New London, where past ham experiences were rehabbed once again. QV is somewhere in the Pacific and, knowing Bob, we bet he will steal Bob Hope's thunder with his antics. 9AND, formerly a code instructor at Yale, is back at his QTH in Ill. Frank Sanchione, Bridgeport radio aide, reports four new portable-mobile units are under construc-

tion; emergency police truck is equipped with both police and WERS units, and all units are working very smoothly with the Misses Wilnot and Betts doing a fine job as operators. IGT, New Haven radio aide, recently completed an 800-ft. movie of WJLH units in operation for WIGB. The movie is now being shown at the different towns in the warning district and is attracting wide attention. Miss Jackson, one of the popular operators of WJLH-1, has left for a two-weeks trip to N. C., where one of her brothers is in the armed forces. The Misses Hewett, Nicholl and Pellicia and Mrs. Hooker are covering WJLH-1 in her absence. WJLH operators now have to attend at least one test period in a period of two months to remain active. A card notification has been sent to all operators. Practice hurricane, flood and fire drills are held during test periods with considerable interest being shown. Each unit originates at least two messages simulating an actual condition. Modification of license has been submitted to include A-2 emission as well as operation in the 224-230-Mc. band. KAT, Guilford radio aide, recently examined six candidates for restricted 'phone permits. Radio Aides AKG and JQK will hold examinations in about a week's time. We are very pleased to again note that New Haven stands as the No. 1 WERS licensee in the country. We wish to extend our thanks and appreciation to radio aides JQK, KAT, IJ, SF, AKG, LTZ, FMV, IGT and Van Een, as well as all WJLH operators for their splendid cooperation in working together as a group. IJ, reporting for SG-WERS in Madison, writes that they will soon have three units in operation for training. Double extended Zepps are being used for all units, and drills are being held Monday nights. KSD passed the radiotelegraph 2nd-class exam and joined the Maritime Service as radio operator. Several of the WJQA units are having good results with A-2. WKAO-55 was heard using A-2. In order to fill the column this month it was necessary to draw heavily on news from WJLH districts. If operators in other districts would get after their radio aides or send in reports themselves it would aid us considerably and be greatly appreciated. If there is no mention about your district it is because it was not reported. News from hams in the services, etc., is also most welcome.

MAINE — Acting SCM, G. C. Brown, WIAQL — QH recently returned from a month at the radio school in Miami and he and the Mrs. spent a few days' leave in Washington, D. C. Ex-ALZ has been transferred from Presque Isle to Boston and has been promoted to a supervisory position in the radio section for the Northeast Airlines. CRI is doing a lot of copying lately to improve his ear so he will be ready when we get back to pounding brass again. IVZ has been promoted to acting CRM in the Navy. BLI is working at Dow Field, Bangor. BWI is in the insurance business. DEO is spending his spare time repairing BCL sets. EBJ recently passed his commercial 2nd-class exam and is angling for a job in the merchant marine. BPX also passed his commercial 2nd-class 'phone exam and plans to go to Boston to try the 2nd-class radiotelegraph exam. What say, you EC fellows? There must be some news floating around in your neck of the woods. Drop us a line and tell us what's cooking. 73.

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — The City of Quincy received its WERS license on April 4th under the call WJYM. EAU is the radio aide, and his assistants are: Quincy, ALP and IHA; Milton, FWS; Canton, KQN; Weymouth, WG; Holbrook, JXH; Hingham, MD and Farring Pratt; Cohasset, CCL; Scituate, FJN. Anyone willing to help out please contact any of these hams. HGU, Watertown radio aide, has re-applied for WERS. A few more new ECs: NBE, West Roxbury-Roslindale section; EU, Somerville; BBL, Manchester. KCT has been appointed regional radio representative for region No. 5. Ex-9JRI has gone to work for the B & O R.R. DID has a new baby YL, his second. 2MHG, now at M.I.T., is a lt.(jg). NAX is working at WBZ. HQY has a new YL baby at his QTH. KRL writes from Philadelphia where he is now working; he was discharged from the Navy and is going to get married in May. GYZ is now in San Francisco. BTL sends a V-mail from somewhere in the Pacific. AYG is now living in Hingham. MQB is now in the Navy at the Great Lakes station. DRO had to go to the hospital. JOH is in the merchant marine. BB reports that WERS is working FB with BDU, GGP, DJ and XYL and MQB's XYL. IVI is now in England. JBH is in Africa with the Medical Corps. IYL is working in Fla. JSV has gone overseas. More hams at M.I.T.: BLQ, DPW, MZS, HXT, IVU, 3ILR, 6UTT-ex-1MIZ, 6CJ, 6IOJ, 6OE, 9WTR. 6KW, 6EPM, 5DBD and 5DXW are working for Raytheon. 8PQF is working for W. E. Co. 60IN, 9ELQ and 1KTX are

working for Sub Signal. XU2MC has gone overseas. KBS is now living in Weymouth. The South Shore Amateur Radio Club had its monthly meeting with the following present: AKY, ALP, CT, HCL, IS, MMH, HGJ, MMU, JMY, FWS, IHA and JXU. DIR is back in the hospital. MD has a sea-going 2nd-class radiotelegraph license. LIO reports that the WERS in Newton is still going strong with a few new hams and YLs. LIO is now a m/sgt. in the 2nd Div. Co. of Mass. State Guard; they have their call of WMSB at the Armory. AIW is busy on new f.m. police radio in Somerville. C. A. McElroy, radio aide, reports that WERS is going fine in Somerville. On Mar. 31st a gang of hams had supper together at the Hotel Continental in Cambridge with 28 present: XU2MC, 6IOJ, CJ, OIN, EPM, KW, UTT, OVK, OE 9WTR, ELQ, 8PQF, DMW, 5DBD, DXW, 4BST, 1LZW, JXU, ALP, BLQ, IVU, MPP, LJN, JMY, EHT, IBF, AYG, KTX and IIQ. It is planned to have another time sometime in June. Anyone interested drop me a card and we will give you the dope. Capt. IIQ, AACS, was home on furlough and expects to leave for overseas. LDF sends a V-mail letter from England; he wants to be remembered to everyone and would like to hear from some of the old gang. LOT is in the Air Corps in Wyo. On April 16th a meeting was held at 18 Tremont St., Boston, to discuss a state emergency operation plan, with hams, radio aides and, ECs from all parts of Mass. and EAO from Conn. There were 39 present including the following hams: KCT, BIV, BSJ, CKJ, IKI, IBF, LVV, MJ, MDH, EKT, LQX, HMK, BLO, CRW, ACM, IHA, BBL, ALP, GAG and 2MPY. It is hoped that at a later date it will be possible to work from the western part of the State right into Boston and also in other directions, by means of our WERS set-ups. Well, gang, I have been chosen to carry on as SCM for another two years and with your cooperation I will do my best.

WESTERN MASSACHUSETTS — SCM, William J. Barrett, W1JAH — GJJ reports three new hams in the section: Norman Bacon, Holyoke; Thadeus Curylo, Ludlow, and John Benoit, Chicopee Falls. MLU sends in the line-up for Hampshire County WERS, WKKW. It includes 10 fixed stations and 12 portable-mobiles. There are 53 operators, of whom 10 are hams. These include Radio Aide MLU and assistants NGH, CGS, FMN and EBF. The set-up includes stations in Amherst, Easthampton, Hatfield, Northampton, Shutesbury and Williamsburg. Population covered totals 52,000. Here at WERS station WJPG we are looking forward to warmer wx to get at our skywires and clean off the soot accumulations and check connections. Worcester received its WERS license Mar. 31st under the call of WJBB. This license covers Holden, Boylston, Shrewsbury, Spencer, Sturbridge, Southbridge, Dudley, Webster and Milford. Contact DJU, the radio aide, if you can help out. How about some news, fellows? 73.

NEW HAMPSHIRE — SCM, Mrs. Dorothy W. Evans, W1FTJ — An FB letter from MMG tells us that he is now in his second term of basic engineering at the U. of Calif. Al informs us that we may expect another ham in his family after the war as his brother, Charles, is now a radio operator in the merchant marine. MLW got married recently, and is at present an ensign in the merchant marine. BWR writes that he is working very closely with the armed services in a civilian capacity. He can hardly wait to apply some of the microwave techniques to amateur radio! CME is anxious to put the harness on again and get to working for the Coast Guard. Stu has been very ill but is much better. JDP and XYL, MWI, plan to take a short trip into N. H. soon. BFT and LVG got together for a swell rag-chew while both were home on leave in March. The Army and Navy surely got a going over! ITF has some hens and is now planning his garden, so guess George will be busy this summer. FTJ is mighty proud of her blue-ribbon winning cocker spaniel, Jerry. He has won three blue ribbons in as many weeks. Dot will be glad to have you drop in to make his acquaintance if you're going through Bow. Your SCM wants to ask a favor. Will you please advise FTJ the full QTH of any N. H. ham now in the services, together with his birthday (month and day will do), as she is starting a card file on her boys and would appreciate your cooperation. So please, if you have this dope, write in to FTJ as soon as possible as she wants everyone possible listed. New Hampshire sends heartiest congratulations to Ken Warner on his 25th anniversary with ARRL and his service to hams over the years.

VERMONT — SCM, Burtis W. Dean, W1NLO — AYP visited AD and KJG recently. Bill is working on a communications set-up for the State Guard in Rutland. FSV was home for a few days visiting the XYL and friends around

Rutland. Ed Rybak, LSPH, journeyed to New York City and got his 1st-class 'phone ticket. Ed also visited the Television Lab. of W2XWV, where he met 2ITL. EKV's QTH is Co. M, 804 STR., Bar. 3511, Camp Crowder, Mo. BD and NLO visited ATF, the OT in Hinesburg, GAE and XYL have a YL operator, Helen Elizabeth, born the 14th. LWN and XYL have their third daughter, Sandra, born the 17th. A letter was received from 8NEM. The last we heard from "Sparky" was a year and a half ago, when he was at radio school in Athens, Ga. Since then he has done some brass-pounding in the So. Pacific. On returning to the States last fall he was discharged from the Army and is now an aircraft engine mechanic at the Rome, N. Y., Air Depot. "Sparky's" QTH is Box 1326, Haselton Bra., Rome, N. Y. GAN has bought a Pontiac. Red claims he is going to use it for his radio service work. Keep those letters coming. 73, Burt.

#### NORTHWESTERN DIVISION

**OREGON** — SCM, Carl Austin, W7GNJ — First, an apology. You can imagine how an SCM must use his imagination these days in order to make up a paragraph for QST. Well, what would a guy think when along came a card from FTA/ITZ headed "Chicago, Ill." FTA and ITZ, his XYL, are doing FB at the Communicator School in Seattle, and have made 23 and 21 w.p.m., respectively, on the mill. It is rumored that CZJ, a rabid anti-e.c.o. man is experimenting with e.c.o.s! He is also acquiring more ham gear for "The Big Day." A card from HXG says that he and the XYL are doing FB at ACS radio school in Seattle; he has made 36.5 w.p.m. and the XYL, with no former experience, is up to 22 w.p.m. His idea is that the kw. is OK for ham power, but that the ham license should be tougher. A welcome V-mail letter from Cpl. FJY brings his regards to the Ore. gang from Italy. Bob says the food is fine, and includes real butter, hotcakes, etc., and several varieties of pies (baked in 18 x 24 chassis pans), but that enemy artillery makes cavemen of the boys. He also says that the convoy he crossed with was written up in a book "To All Hands" in Feb. *Omnibook*. Bob keeps up with things through QST, even in Italy. HHH has a CAP code class, and GNJ has a class of about 25 prospective radar men. How about an Oregon Dawg House for non-reporters? Where are HCW, DZT, GSX, IBY, AEM, EBQ, GTV and others? 73, Carl.

**WASHINGTON** — SCM, O. U. Tatro, W7FWD — Radio Aide JBH advises that Skagit County now has WERS license KFEY for 8 units and plans are laid to expand in the near future. The license was issued upon first application which shows what careful preparation can accomplish. Two control stations are located in Mount Vernon and the rest are mobile units. Hams participating are JBH, DQ and FXD. Results have been excellent and the station has been heard as far away as Everett. HML has graduated at Treasure Island and is awaiting assignment. He says: "The one big thing I feel I have learned is that there is no limit to what can be done by electronics; the future seems bound up in a need, a dream and some wire!" ILC, S1c (RT) is at Great Lakes, Ill., and says, "This Navy life is teaching me the value of a washing machine. Could really make some money here if I had one." Gene recently left the State Highway Patrol radio service. The following is evidence that the radio amateur is needed and is doing a real service for the State by keeping its radio communication system in repair and operation: ICH, EGX, HPJ, ELR, HU, BAO, IWM, EGV, SA, CMX, AYO and ILC, who has just joined the Navy. It is reported that ICH will soon be in the Army and EGX in the merchant marine. AIU, HWG and GKY are also doing radio operating and servicing for the State Forestry Department. 73, Tate.

#### PACIFIC DIVISION

**NEVADA** — Acting SCM, Carroll Short, jr., W6BVZ — Greetings, gang. Hope you will continue to send in dope so we can keep the news on Nevada coming out. QNV enlisted in the Navy, received an S1c rating and is now in boot camp at Great Lakes NTS. TFF is chief operator for TWA at Boulder City. He has three girls with 3rd-class 'phone licenses working for him. QMF, formerly working at Boulder Dam, is now at Friant Dam in central California. TPZ is now at the Mesa Verde National Park in Colorado, having recently transferred from Boulder Dam National Recreational Area. UQY is working for Basic Magnesium, Inc., at Henderson. PWE, who used to work for the So. Calif. Edison Co. in Boulder City, is also with BMI. RXG is chief operator at KENO in Las Vegas. He also maintains the

radio equipment of the police department of that city. POD, who formerly was a Nevadan, is living on the Coast, having last been reported at Capistrano, Calif. 1JOL, whose home is W. Medford, Mass., is now operating the AACS radio station at the Las Vegas Army Air Field. He is a 1st lt. and reports he is the only ham at the station.

**EAST BAY** — SCM, Horace R. Greer, W6TI — EC, QDE; EC v.h.f., FKQ; Asst. EC v.h.f., OJU; OO v.h.f., ZM. On April 20th, according to EE, another FB WERS meeting was held at the Oakland City Hall. Many thanks to the gang for the many letters received throughout the country concerning my suggestion that a new boat be named after Amateur Radio. The names I suggested were, *ARRL*, *QST*, *Amateur Radio* or *Hiram Percy Maxim*. I understand that the suggestion was relayed on to President Bailey in Washington by K.B.W. The East Bay section wishes to extend greetings to Ken Warner for having completed twenty-five years of managing the League on April 26th of this year. Also we all wish Geo. Hart lots of luck and we will all miss him now that he has answered the call of his country. Geo. did one swell job as Acting Communications Manager. We are all fortunate to have 9WWP to carry on in this capacity, as she has been working with George for some time. EY reports his daughter has joined the WAVES. Another day closer to victory, *TI*.

**SAN FRANCISCO** — SCM, William A. Ladley, W6RBQ — EC: DOT. RFF has left his operating post at WVV and is now in the Navy. CIS, ex-SCM for San Francisco, was in a collision between a bus and street car in S. F., but managed to get out whole. RH writes in from Maine reporting that all is well. A nice letter arrived from HJP, who is now overseas. His address is: Lt. Art Monsees, APO 953, c/o Postmaster, San Francisco, Calif. Ens. KB6ILT spent some time with RBQ while awaiting final instructions for his new assignment overseas and he advised that while he was stationed in Guam they heard 5-meter telephone conversations from various American amateurs on several occasions. W2s, 3s, 6s and 9s were logged. Rod has the log books to prove it. This appears to be somewhat of a record for 5-meter reception. Lt. T. J. DeLaSaux, USNR, is on his way west. His address is: c/o Fleet Post Office, San Francisco, Calif. Although Del is not a licensed amateur he has for many years generously given of his time on behalf of amateur radio and deserves much credit for those years of service. RAF is now RM1c and also the father of a baby boy. He is teaching radio at Treasure Island. LEV and 7EO are also teaching radio at T.I. QGN, who has been reported missing for the last eighteen months, now is reported by the War Department to be a prisoner of the Japs. WB is making another trip east for technical radio. LFZ and BUJ are still busy on WERS network drills. K6TTY, who served at Guadalcanal and is now communications chief, reports from the following address: T/Sgt. J. L. Coleman, APO 2, c/o Postmaster, San Francisco, Calif. K6TOP, after serving at Guadalcanal, is now a 1t. on duty here in the States. A letter comes to hand through LLW at Salinas from M/Sgt. Al Towner, who will be remembered for his operating at 6NLL and WLW for AARS. Address as follows: M/Sgt. Albert Towner, 919247 Ships Complement Det. Section "B" CPE, Charleston, S. C. LLW is pounding away at math again just in case his services are required by United Air. Mail received this month from Joe Slizen, ex-operator at K6QUJ, advises he is now ARM2c with the Navy. Joe's prior service was with the Army. Address: Joseph Slizen, ARM2c, U. S. Naval Hospital, Navy 10, c/o Fleet Post Office, San Francisco, Calif. Would appreciate news from more of you fellows wherever you are. 73, Bill.

**SAN JOAQUIN VALLEY** — Acting SCM, Ralph C. Lowry, W6MIW — On Mar. 1st I moved to Sacramento, which means that I am no longer eligible to hold the office of Acting SCM of this section. I have contacted some of the local amateurs to find a successor but so far I have not found a suitable candidate. Please send in nominating petitions for this office to ARRL as soon as possible.

#### ROCKY MOUNTAIN DIVISION

**COLORADO** — SCM, H. F. Hekel, W9VGC — BQO was successful in getting the WERS application signed and sent to FCC on Mar. 22nd. OWP left for the Navy. His fellow employees of the telephone company at Brush gave a farewell party for him. FKK is going it alone for a while; his XYL was called back home because of her father's illness. 3JIN was laid up with a lame back. His new address was reported in error as being across the street from CAA;

(Continued on page 74)



A FEW YEARS AGO we bought a house, and like most new landowners unskilled in such matters, we promptly decided to make our lawn the pride of the neighborhood. We had a lawn there already, and obviously all it needed was a little weeding and some fertilizing.

We tried everything they suggested in the books. We weeded and fertilized. We had the soil tested and we spread lime. We rolled and we watered. We did everything we could think of, but the lawn still looked scraggly.

Finally we sought out a neighbor who had a good lawn and asked him what he put on it. He said, "Grass seed." We tried it, and the lawn looks fine now.

We are told that this is very humorous, though we remember our backaches too well to think it as funny as our friends do. They say that sowing grass seed to get a lawn is as obvious as putting up an antenna to get a signal. It really is just about as obvious.

Perhaps we should not be writing this to amateurs because they are about the only group we know who put up antennas for fun. Many amateurs appreciate what a good antenna will do, and a few hams can claim to be real experts at antenna design, as the Navy has discovered to its advantage.

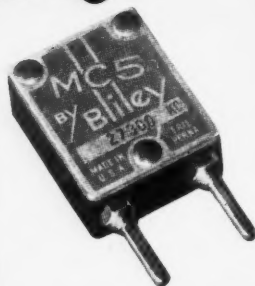
What really prompts this page is the general feeling among radio engineers that post war receivers will have to operate "without antennas." It is generally agreed that most people will refuse to spend ten cents on an antenna even though they may spend several hundred dollars on the receiver. The fact that they can get better results with a ten dollar aerial and a receiver costing a fraction as much makes no difference. They don't believe it, and any manufacturer who says his receiver needs a good antenna is just making excuses.

There are still plenty of hams who feel that a good test of receiver is its ability to get signals with no antenna connected to the input. This does not test sensitivity; it tests shielding. A set with poor shielding gets a 100% score, while a set such as we build for the Navy is so well shielded that it goes completely dead when the antenna is removed. We might add that anyone who thinks that Navy set is not sensitive is due for a shock after the war.

We are writing this page in the hopes that amateurs will plant a little grass seed for us after the war. If amateurs can persuade radio users — broadcast listeners as well as hams — to use and appreciate well designed antennas, they will have made one of their greatest peacetime contributions. And this is one case where virtue will not be without reward. There's gold in them thar hills — for you!

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## Bliley Crystals

## Amateur Activities

(Continued from page 72)

he lives 3 blocks due west at 978 So. High. When last reported on he was attending a radio school at Dayton, Ohio, and expected to be returned to Lowry Field. TFP and ACB are busy comparing notes on the losses in their flocks of baby chicks. TFP is leading with a loss of only 4 out of 54 chicks. The Radio Widows Club put on a real swell covered dish supper Mar. 31st. Mildred, 3JIN's XYL, was the hostess. It also was a sort of house-warming affair for their new home. The OMs were included at this party, and who do you suppose washed the dishes? Yup. That's right. Olivia Webber was the hostess for the RWC's St. Patrick's Day party Mar. 17th, and Mabel (by Heck) was head man for the club's Easter party April 6th. A V-mail letter was received from S/Sgt. EZL at Oahu, T. H. He reports that OMZ is at Camp Pinedale, Calif. FNL is in Hawaii. After seeing action with the Navy in the Pacific, DZB has returned to the mainland to attend Officer's Training School in Mont. WQO is on maneuvers with an airborne signal outfit in Tenn. QDC wrote EZL from North Africa telling that he had been snowed on in Africa. He passes his best regards to the gang in Colorado. CAA is on his way to Hartford, Conn., and by the time you read this he should be on his way back home again. Lt. ODS sent another V-mail letter from Africa and says his job as communications officer and maintenance officer is not so bad now; he has 30 good helpers to do the hard work. 5JYW, ex-9FCE, wants to hear from Colorado friends. His address is: Joe F. Marquez, S1c, Co. 13-44, Sec. M, Bliss Electrical School, Takoma Park, Washington, D. C. He is attending a primary radio technical class and has been in the Navy five months. He is an old side kick of FKK, who is now a s/sgt. at Lowry Field. FKK reports that he got his promotion Mar. 20th and is chief of maintenance. FAN was C.M. but he has been sent overseas. HCQ is home on a 21-day furlough. He says the winters in the Caribbean are not as bad as in Colorado. CAA, TRR, TFP, ACB and several others on the emergency staff of the Mountain States Phone Co. were called out and sent to the southern part of the state to span a bad break on the telephone lines. This was done with company equipment and under conditions that were anything but pleasant and the snow was this deep. 73, by Heck.

### SOUTHEASTERN DIVISION

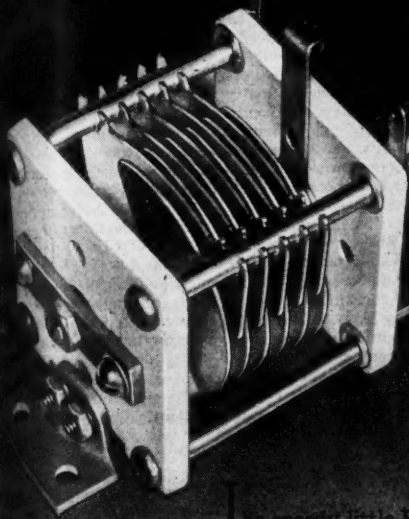
**WESTERN FLORIDA** — SCM, Oscar Cederstrom, W4AXP — The sympathies of the section are extended to KB in the loss of his mother. A welcome report was received from GTJ of Panama City. Joe is not with the Fla. State Guard now, but BJF is holding that job down, so everything is clicking merrily along. GRI is still at Panama City. QGF is at Tyndal Field. ICU is in the Army. BCZ is at Tally and runs a radio shop there. A. B. Hutchinson is working at the shipyard. Randal Glass is at Eglin Field. Frank Cobb, L.T., is still in Panama City. FRQ is in Tex. AXP is convalescing from an operation and wants to thank all the hams and operators for their nice cheery visits, and for the reading material they brought to the hospital. 6PNI and ex-6BRF visited the Old Maestro after his return home. Thanks for the visits by enlisted men and WAVES and for the nice things they sent and brought. The OM has been catching up on his reading and listening to his favorite radio programs while laid up. Blackman, Hinshaw, Watson, Shedd and the OM were promoted from P2 to P3 this month. No need to say that we are all proud of our promotions. News from any part of Florida, and especially from our Florida hams and friends in the services, will be appreciated. 73 to all from *The Old Maestro*.

**GEORGIA** — SCM, Ernest L. Morgan, W4FDJ — AAT says that he has not been out of the country, as this column reported. DIZ is now a 2nd Lt. in the USMCR. 1NJJ is in Savannah. FOL has been in Hawaii for some time and Cookie is there with him now. GIA is in the Navy. QZ is now in Cuba. DYX is associating with BZA, IHH, KD and a W5 in Puerto Rico. CSZ is out of the Signal Corps after a couple of years overseas, and hopes to get back in the game in the merchant marine. 73, Pop.

### SOUTHWESTERN DIVISION

**LOS ANGELES** — SCM, H. F. Wood, W6QVV — Considerable expansion has taken place in Los Angeles County WERS with more groups planned. A meeting was held on

(Continued on page 76)



# HIT

AND

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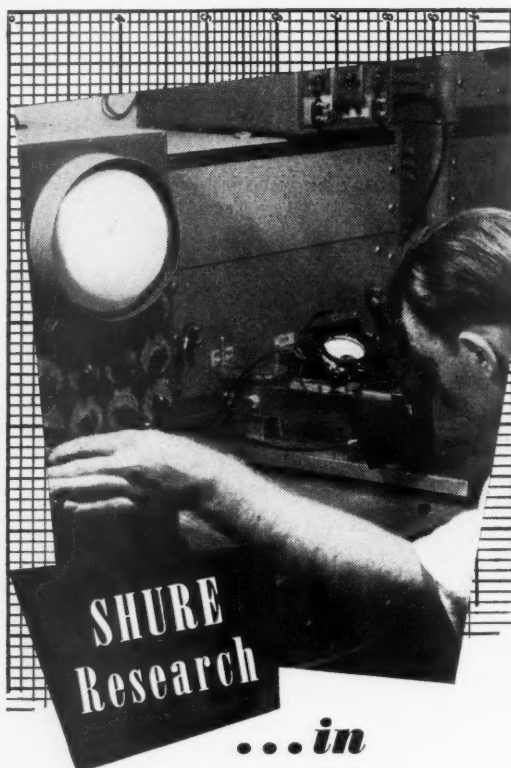
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## Amateur Activities

(Continued from page 74)

April 19th presided over by GVT. About fifty attended. Reports were given by the aides from Inglewood, Long Beach, Los Angeles and various points under KGCL in the Los Angeles County set-up. Capt. Ellison gave a brief talk in which he complimented several of the units for their work in drills and in some actual cases of handling communications. Regular meetings of this type are being scheduled. KGIC in Inglewood reports considerable activity during the past month with regular drills being held and new equipment being built, new operator permits received and more operators being trained to properly man their equipment. AM reports that Long Beach KGWE has no transceivers now and the network is working out fine. His 6-element beam tested with Malibu and Santa Barbara, the latter about 100 miles. RO's new power supply looks like a lit-up Christmas tree, so Don tells us. There are about 40 operators now in that group and they spend the first hour of the periods testing and checking and the rest of the time in contacting other areas by proper arrangement. At one recent test 9 towns were contacted. George West reports that Altadena will be coming on the air soon with 30 rigs lined up. A very fine set-up for the main control station caused a lot of headaches for a while, but all have recovered now. Major UQL reports that he is still as interested in ham radio as ever and is planning great things for "after." SSU just got back from a Western Hop and is looking swell; he likes his radio work and is really going places. PPW telephoned that he still goes to sleep with the cans on, but otherwise is feeling fine again. No word from MFJ yet. Doc Worsham reports the arrival of a grandson to TSN on Apr. 16th. 5JRW writes from Dallas, Tex., that he would like to know where PPK is now. Drop him a line if you know, please. RFG of San Berdoos says he reads QST whenever he can get hold of a copy and that he is now in Florida fixing radar equipment and likes the work a lot. Bet he sets it by watching the bathing beauties on the beach. We understand from Don McCoy that HHJ, now RM1c, was back in his old home town of North Hollywood recently. QLZ is in from Arizona and wants to get into WERS work here. He has his gear all packed ready to be shipped out. Address me differently from now on as I have moved to Burbank. Haven't got the ham shack out there yet, Jimmy Rollins, RM2c, but will be sure it's ready when you get back for good if Gramp's strawberry patch can be moved. So fer now best of luck and hope to see you all soon. 73, Ted.

ARIZONA — SCM, Douglas Aitken, W6RWW — The Tucson Short Wave Assn. will graduate another class this month. They are certainly doing a bang-up job in teaching code and theory and many of their graduates are now in active service. GS gets homesick every time he sees all the radio activities. UFF was home on a furlough recently. We lose one of our best hams when TPP moves to Denver. TCC dropped in on the Tucson gang. We understand SOB is contemplating a move to Ore. Well, that's a swell country and where this SCM lived for 25 years. Glad to report ROP's full recovery. IGO is manager for one of the Radio Specialties stores in Phoenix. BUX is tinkering with a new coaxial for his WERS layout. NGJ has been revamping his shop to make for more convenience. REJ has finally gotten settled in this Army assignment business and will be a radio operator in the transport service. TSZ is overseas, somewhere in the Pacific area, and has been upped to RT1c. QNC dropped in for a chat — he has many plans for postwar hamming, including radio equipment for that private plane. OZM listens to his hens squawking instead of the radio nowadays — reaping quite a harvest of fruit! And a private fish pond where he can "jest set and fish" — gosh! The Verde Valley bunch are busy getting out copper for the war effort. UG has been promoted to lieutenant colonel. MLL has been so busy with school-teaching chores, that he has had to lay aside radio doings until vacation time. NRP may get into the Navy at last. IYZ has been reported as being in the Ft. Huachuca Hospital. Please, you fellows scattered all around, let's have an occasional postal card. 73, Doug.

### WEST GULF DIVISION

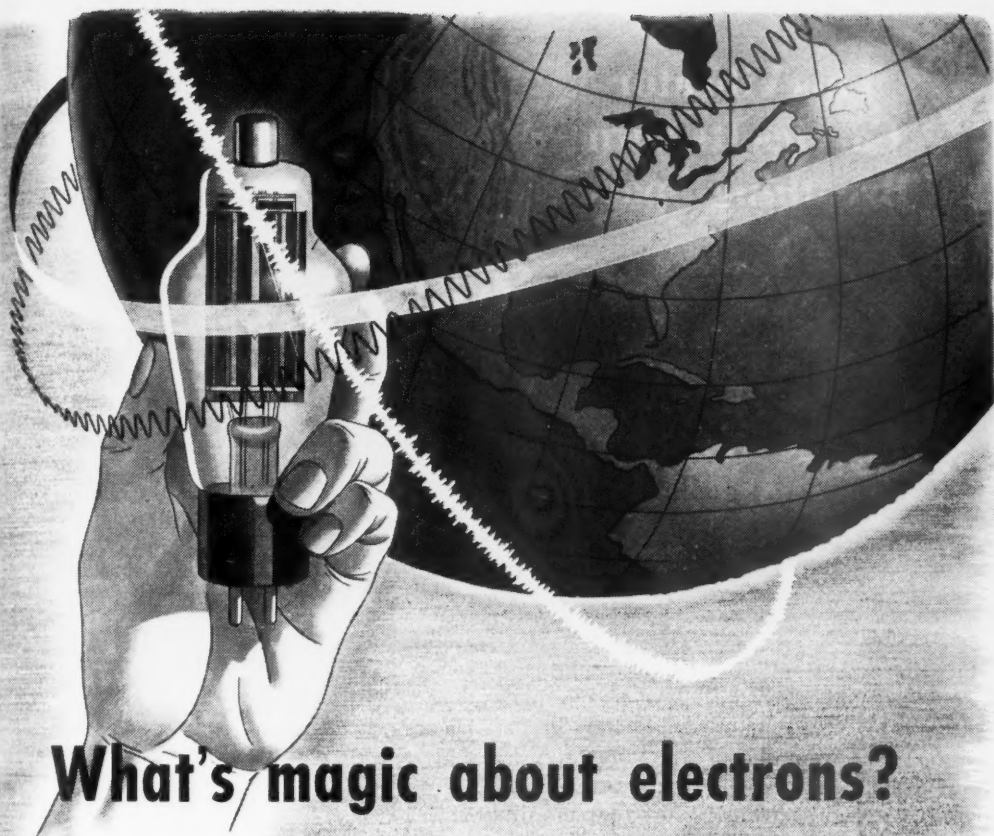
NORTHERN TEXAS — SCM, N. R. Collins, jr., W5IAU — IIB, now a Lt. in the Army, is in an electronics training group at Harvard. JPA, an ensign in the Navy, graduated in March from Navy Penn. State Diesel

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## What's magic about electrons?

The magic about electrons is man's ingenuity in putting them to work. The magic about electrons is their promise of service in marvelous ways only hinted at in the last few years. Now harnessed for war, the science of electronics will later work to enrich the peace.

Working in close cooperation with Army and Navy engineers, Delco Radio has applied its knowledge and skill to putting electronics actively and effectively into the fight for Victory. In Delco's laboratories, principles are explored and exploited; in

Delco's engineering department, designs are evolved to apply these principles; and on Delco's production lines, complete equipment is manufactured with the speed and skill that only a large manufacturer of precision radio instruments can bring to such work.

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**MALLORY**

## Amateur Activities

(Continued from page 76)

School. GOS is now with G.E. in Bridgeport, Conn. KPO is studying electrical engineering at Texas Tech. FZU is a lt. (j.g.) in the Navy as a radar officer. CZZ and CYJ are still working at the Terrell aviation school, and have taken over firemen's duty as well as radio mechanic work. GDH is a sgt. in the Air Forces and stationed at El Paso. JIF and FLJ are still working at the Ft. Bliss sub-depot. DDO was with American Airlines in El Paso, but has now joined the merchant marine. DAA, JKB and IZB took the commercial exams recently. All have 2nd-class telegraph and DAA has 1st-class 'phone. The City of El Paso has filed application for WERS license. NB is still with the fire department in El Paso and also is doing government work. 3JOF/5 took the 2nd-class 'phone exam and also has acquired a private pilot's license and an XYL. He is a lt. in communications at Ft. Bliss. My thanks go to DAA, JKB and Barty Bartel for swell reports. Keep up the good work. 73, N. R.

NEW MEXICO—SCM, J. G. Hancock, W5HJF—G7L is sending in a monthly report. He is busy with noisy remote lines and leaky coaxial cables at KFUN. The ole confirmed brasspounder, JZT, has developed quite a technique with the mike at KFUN on the soil conservation program. FMM is still chief at KGGM. 3IRM (ex-5ND jr. operator) got his wings as 2nd lieutenant last month and spent a few days with the OM, ND, at Ft. Worth, Tex. ND is still building houses at Orange, Tex. Harold Weeler (LSPH) is in armored infantry at Camp Bowie. HJF is bringing up a new ham by correspondence in St. Louis, Mo. Why don't you take him off my hands, 90UD? 73, Jake.

## BRIEFS

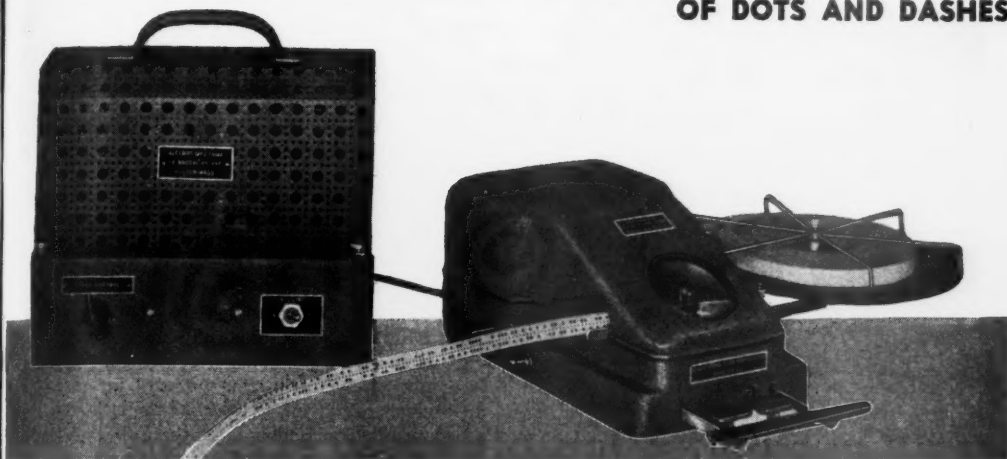
The Australian News and Information Bureau, 610 Fifth Ave., New York City, sends us the following Australian Broadcasting Commission schedule of overseas daily short-wave transmissions, current from Dec. 29, 1943:

American War Time	Greenwich Mean Time	Transmitters and Frequency	Directed To	Language Used
8-8:45 A.M. (EWT)	1200-1245	VLG Melbourne 9540 kc. (31.45 m.)	U. S. A. (East)	English
9-10 A.M. (EWT)	1300-1400 ditto		Indo-China	French English
10-10:45 A.M. (EWT)	1400-1445	VLG9 Melbourne 7220 kc. (41.45 m.)	India	English
8-8:45 A.M. (PWT)	1500-1545	VLG Melbourne 9580 kc. (31.32 m.)	U. S. A. (West)	English
10-15-10:40 P.M. (PWT)	0515-0540	VLG3 Melbourne 11710 kc. (25.62 m.)	U. S. A. (West)	English
1:55-2:40 A.M. (EWT)	0555-0640 ditto		Tahiti	French
2:55-3:25 A.M. (EWT)	0655-0725	VL12 Syd. 11870 kc. VLG3 Mel. 11710 kc.	Great Britain	English
3:30-3:50 A.M. (EWT)	0730-0750	VLG3 Melbourne 11710 kc. (25.62 m.)	Pacific	Japanese
4:25-5:25 A.M. (EWT)	0825-0925	VLG4 Melbourne 11840 kc. (25.35 m.)	Noumea	French
5:30-6 A.M. (EWT)	0930-1000	11870 kc. (25.27 m.) 15320 kc. (19.58 m.)	Great Britain	English
ditto	ditto	11840 kc. (25.35 m.)	Australian Forces in the Pacific	
6:15-9:35 A.M. (EWT)	1015-1235	15320 kc. 11840 kc. 15320 kc. 9540 kc. 9540 kc. 9540 kc. 7220 kc.	Asia Shanghai Batavia Batavia Pacific Saigon Bangkok	Chinese English Dutch Malay English French Thai

The AAROD (Associated Amateur Radio Operators of Denver) has purchased another \$25 war bond, making a total of six bought so far. Another one will be obtained soon, after the 1944 dues are paid. The club is still salvaging all old newspapers, magazines, iron, copper, etc. and using the proceeds to buy bonds which will eventually be used in the purchase of good radio club equipment. Recently two QST subscriptions were awarded—one to W9CAA and one to W9BQO—for the best attendance records at AAROD meetings for one year. They both had perfect records at the bi-weekly meetings.

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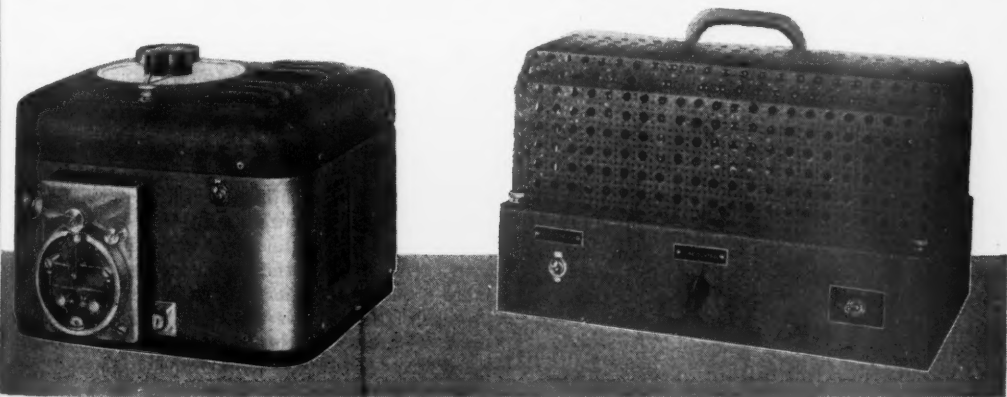
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either tone for keying a radiotelegraph transmitter, or to key a transmitter through the medium of a heavy duty pivotless relay. The tone can be impressed on a radiofrequency carrier current, sent to a remote transmitting station, filtered and used to operate a transmitter without requiring relay action.

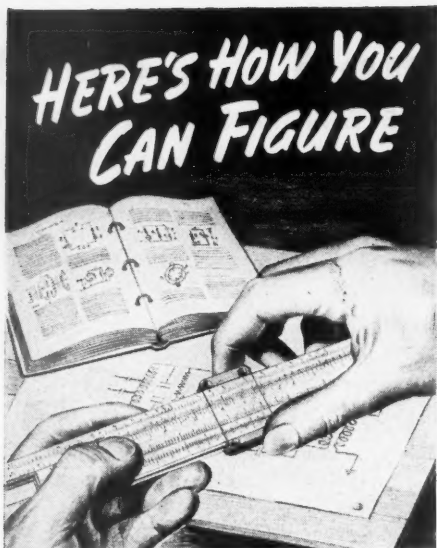
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## WWV Schedules

**STANDARD-FREQUENCY** transmissions are made available as a public service by the National Bureau of Standards over its standard-frequency station, WWV, on the following schedules and frequencies:

2.5 Mc. — 7:00 P.M. to 9:00 A.M. EWT (2300 to 1300 GMT).

5.0 Mc. — Continuously, day and night.

10.0 Mc. — Continuously, day and night.

15.0 Mc. — 7:00 A.M. to 7:00 P.M. EWT (1100 to 2300 GMT).

Each of these radio frequencies is modulated simultaneously at accurate audio frequencies of 440 cycles and 4000 cycles, excepting 2.5 Mc. which carries only the 440-cycle modulation. In addition, there is a 0.005-second pulse, heard as a faint tick, every second, except the 59th second of each minute. These pulses may be used for accurate time signals, and their one-second spacing provides an accurate time interval for physical measurements.

The audio frequencies are interrupted precisely on the hour and each five minutes thereafter, resuming after an interval of precisely one minute. This one-minute interval is provided to give the station announcement and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. The announcement is the station call (WWV) sent in code, except at the hour and half hour, when it is given by voice.

The accuracy of all the frequencies, radio and audio, as transmitted, is better than a part in 10,000,000. Transmission effects in the medium may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.00001 second. The 1-minute, 4-minute and 5-minute intervals, synchronized with the second pulses and marked by the beginning and ending of the periods when the audio frequencies are off, are accurate to a part in 10,000,000. The beginnings of the periods when the audio frequencies are off are so synchronized with the basic time service of the U. S. Naval Observatory that they mark accurately the hour and the successive 5-minute periods.

Of the frequencies mentioned above, the lowest provides service to short distances and the highest to great distances. In general, reliable reception is possible at all times throughout the United States and the North Atlantic Ocean, and fair reception over most of the world.

Information on how to receive and utilize the service is given in the Bureau's Letter Circular, "Methods of Using Standard Frequencies Broadcast by Radio," obtainable on request. The Bureau welcomes reports of difficulties, methods of use, or special applications of the service. Correspondence should be addressed to the Director, National Bureau of Standards, Washington, D. C.

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**38,000 hours  
of service from a pair  
of HK-54s**



JOHN F. IRELAND, technician in charge of the Barnstable (Mass.) County Police Radio System, deserves much credit for the remarkable life of this pair of HK-54 tubes.



FINAL AMPLIFIER of the main station (WRAQ) at the Barnstable County Jail and House of Correction, showing the pair of Gammatrons still on the job after approximately 38,000 hours of operation.

## WRAQ REPORTS GAMMATRONS STILL IN CONSTANT OPERATION AFTER 57 MONTHS

Strong proof of the extraordinary life of Gammatron tubes is contained in the following report from the service files of WRAQ as prepared by Technician John F. Ireland: "Our main station is on the air 24 hours daily, operating on a frequency of 39,900 kcs. The final amplifier of this transmitter uses a pair of HK-54 tubes with 1100 volts on their plates.

"These HK-54s (Serial Nos. 2270 and 2271) were installed in the transmitter on August 3, 1939. Except for shut-downs of short duration for minor repairs and the checking of other tubes, these 54s have been in continuous use since installation, and are still on the job after approximately 38,000 hours.

"To further the life of these tubes the filament voltage, during standby, is dropped from 5.0 volts to slightly under 4.5 volts, a relay shorting the dropping resistor when plate voltage is applied.

"The present modulator tubes, also HK-54s, were installed in the later part of 1939, and from all indications still have a long way to go

before being retired. Filament voltage of these has the same treatment as the above."

Every Gammatron is built of the same materials, is exhausted in the same severe manner, and passes the same rigid tests as those in operation at WRAQ.

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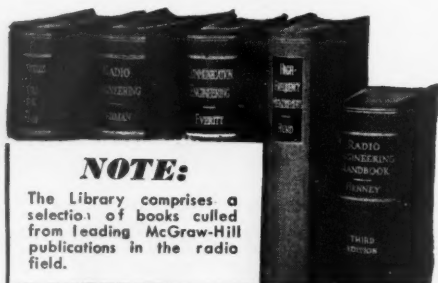
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## Hints and Kinks

(Continued from page 69)

Care was taken that none of the turns in the spiral was shorted out.

The element is insulated with a piece of very thin mica rolled into a tube, which in turn is inserted in the hole bored in the copper tip. The lower end of the spiral is laid in a notch filed in the outer opening of the tip bore. This notch was made deep enough to pass the shank, which was forced into the bore after all other parts were in place.

The shank is a 9-inch length of 1/4-inch steel tubing. The copper wire from the heating element was insulated with asbestos and led through the shank, which was then forced into the tip bore for about 1/4 inch and brazed there, together with the ground lead (lower end) of the heating element. Silver solder was used for the brazing, with borax for a flux.

A handle was made from a section of broomstick drilled to accept the shank. Ends of a 6-foot length of No. 14 lamp cord were passed through the handle and soldered to the shank and the lead from the heating element. The shank was then forced into the handle. Battery clips were attached to the cord.

A simpler device, limited to very light work, is described by J. R. LaCroix, Brockhurst, Templewood Lane, Farnham Common, Buckinghamshire, England. In this device a metallic mechanical lead pencils used as one electrode, the lead being extended to project about 3/16 inch. The work itself forms the other electrode. Wire leads are brought from a 4- or 6-volt battery, one going to the pencil and the other to the work. The circuit is closed by touching the spot to be heated with the pencil, at the same time applying rosin-cored wire solder. The lead will become red hot in a very few seconds. Care should be taken to avoid forming an arc at the contact, since soldering, not welding, is the object.

## Ferrying Command

(Continued from page 19)

signs and safest methods of entry are taught, for such familiarity with routes and codes may prevent serious blundering upon future occasions in actual flight.

In the code room higher operating speeds are attained and sending practice is emphasized. Men are divided into small groups to simulate actual networks such as would be encountered along actual Air Transport Command routes. A microphone on each desk enables the student to practice the voice procedure used when working with radio towers and the like.

At the present time there are a number of WACs among the code instructors. It is interesting to note that the WACs find little difficulty in learning c.w. and they have been an inspiration to the boys at the school — who marvel at their code speed.

(Continued on page 84)



*"... So Many Owe So Much To So Few ..."*

**I**n peace, the Nation's debt to the radio amateur was great. During hurricanes, floods, and other disasters, he sprang forward with emergency communications. His endless hours of patient experimentation—particularly on the high and ultrahigh frequencies—helped open up, as if by magic, whole new segments of the radio spectrum. Traffic enthusiasts surprised the people with unselfish service; DX hounds fostered international good will.

In this "radio" war, the "ham," along with the professional, became the backbone around which the Services and war

plants built the myriad, complex communications systems of war, and the secret electronic weapons. He has trained and inspired the new recruits—the tens of thousands of potential "hams."

Hytron, especially, owes much to the radio amateur. When he entered the Services and war plants, he took with him a knowledge of Hytron tubes—particularly v-h-f types—and an admiration for them. Through his enthusiasm, these tubes became vital parts of war equipment. When the time comes to speak out for the return of his precious frequencies, Hytron will not forget him.

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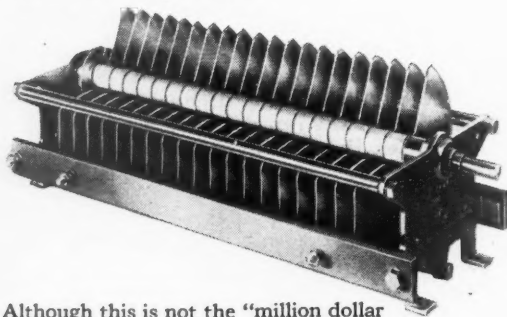
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(Continued from page 88)

The equipment laboratory is supplied with transmitters identical to those used in planes. These long-range transmitters will reach half-way around the world under proper conditions. Individual attention is given each operator, and no more than three or four men are assigned to each unit.

All is not taught in the classroom at ARTU, and much emphasis is placed on active training in the air. It is not unusual for a man to be called from class to board a plane. On such a trip an instructor accompanies the student and is thus able to determine the operator's ability in actual flight. Use of the rubber raft and life-saving accessories are taught as one of the many incidental, yet highly important, subjects at ARTU. The finished graduate is a thoroughly schooled aircraft crewman as well as radio operator.

Graduates of the ARTU scatter to all parts of the globe and become integral parts of the crews that deliver aircraft from the factory assembly lines to the fighting fronts. ARTU trained men are among the world's finest flight radio operators and of a quality that puts them on a par with the skilled pilots, mechanics and others who make up the huge Ferrying Division of the Air Transport Command.

The operations of the Ferrying Division have demonstrated the necessity for improved radio aids to aerial navigation. The development of radio navigation has made overwater air travel a much simpler process than it was ten years ago. No doubt many developments yet unthought of will come from the hands of our radio operators doing their bit flying the overwater airways of the world in the present war.

## Happenings of the Month

(Continued from page 87)

These letters, assembled in a beautiful testimonial volume handsomely bound in red leather embossed in gold, were presented to Secretary Warner at an anniversary dinner given him by the Hq. staff on the evening of the 26th. That volume, it may be said without exaggeration, constitutes as notable a tribute as any man in public life ever received. Its "author's list" is a roster of radio's leaders in government, in industry, in communications, in broadcasting, in engineering and research, in allied legal, publishing and other circles — and, of course, in amateur radio.

We earnestly wish that all of these letters could be reproduced in *QST*; they would warm the cockles of every ham's heart. That being manifestly impossible, excerpts from a few notable examples must suffice.

From Stephen Early, Secretary to President Roosevelt:

Dear Mr. Warner:

Just before he left Washington the President asked me to send you his congratulations on your completion of twenty-five years of service as secretary of the American Radio Re-

(Continued on page 88)

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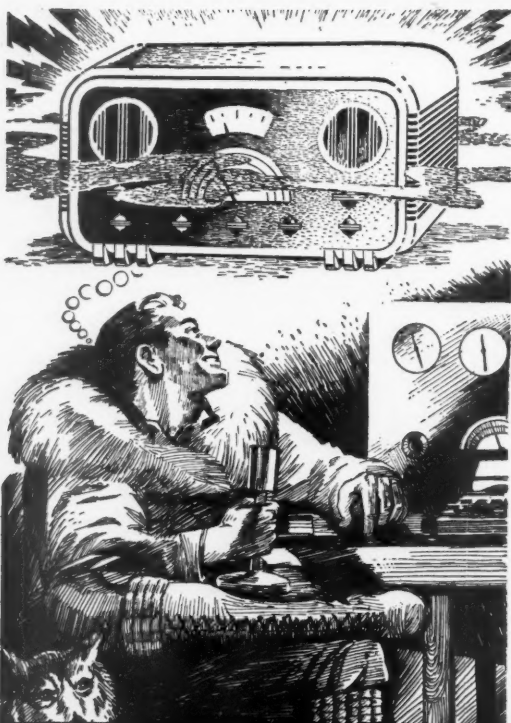
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RADIO MFG. ENGINEERS, INC.

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(Continued from page 84)

lay League. The work of this organization in fostering and sustaining the amateur movement and in training its members to meet the responsibilities which now are placed upon them has been a significant contribution.

The President feels that your own part in this contribution, both in the prewar period of preparation and in the active enlistment of the amateur body for national service, has been a most productive one, and he joins with your friends and associates in the American Radio Relay League in sending you hearty good wishes on this occasion.

From the Chief Signal Officer, Major General  
H. C. Ingles, USA:

Dear Mr. Warner:

... The practical value to our country of radio amateurs has been demonstrated many times during the period in which you have so skillfully directed their operations, and helped solve their problems. It is in large measure due to your profound understanding of the difficulties to be overcome and your vigorous leadership in attacking those problems that our American amateurs were able to render such excellent aid in communication work during floods, earthquakes and other catastrophes when wire lines and other normal communication facilities were disrupted or destroyed.

Following quickly upon the heels of Japan's attack in the Far East, hundreds of members of the ARRL, which you helped to organize and direct, answered the call of our country and enlisted in the Signal Corps and other branches of our Armed Forces. Then, too, through your efforts, and those of QST ... the radio silence for amateurs demanded by our government following the opening of hostilities, was prompt and complete.

Your loyalty and patriotism is deserving of the highest praise, and I commend you for your spirit of cooperation at all times. May you enjoy continued success in your undertakings.

From the Director of Naval Communications,  
Rear Admiral Joseph R. Redman, USN:

Dear Ken:

There is no need to repeat what everyone knows. The part the amateur has played in making the United States the leader in modern communications is history, but I believe that this great success was due to excellent cooperative action and organization under able leadership. You have been that leader and the fact that you have held the helm for such a long period is ample proof of your own personal qualifications and integrity. ...

To have served one organization twenty-five years is an honor. To have helped organize and so guided an organization through such a period that today it stands stronger and more respected than ever, and this in the face of increasing competitive pressure, is more than just an honor. It is an outstanding achievement and rates the highest approbation. In a country under a monarch you would be "knighted" because you have the sincere and wholehearted respect and admiration of many thousands of individuals scattered throughout the land. ...

From Brig. Gen. H. M. McClelland, USA, Air  
Communications Officer of the AAF:

Dear Ken:

... In the implementations of communications plans on a global scale to meet the needs of the Air Forces, this office has developed a keen appreciation of the individual contributions of radio operators and engineers made possible through their background of amateur experience. The radio amateur, like the AAF as a whole, always has been imbued with a progressive and constructive spirit, alert to radio operational and technical advances.

You and your organization have done and are doing a splendid job. This office looks forward to the day when your organization may resume its customary radio activities, so effective in training personnel for responsibilities equally valuable in military and civilian radio fields. ... I hope that the next score of years may be as successful ones for you and the ARRL as these many years of past successful leadership on your part.

(Continued on page 85)

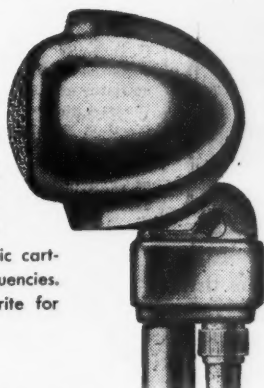
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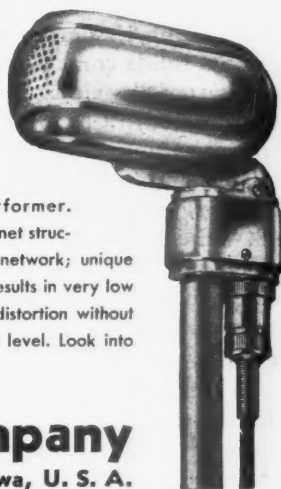
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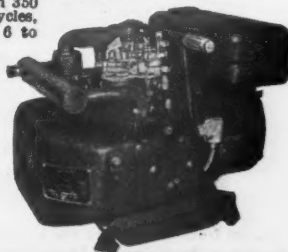
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(Continued from page 86)

From Capt. E. M. Webster, USCG, Chief Communication Officer of the U. S. Coast Guard:

Dear Warner:

... From my experience both as Assistant Chief Engineer of the Federal Communications Commission and as Chief Communications Officer of the U. S. Coast Guard, I am well aware of the value of the amateur to his country and the contributions he has made to the radio art. It is difficult to conceive of amateur radio without the ARRL; it is even more difficult to imagine the League without K. B. Warner.

I know from long association with you and your work that in you the League has a most capable and loyal officer, and that in large measure you have personally built it into the splendid organization it is today.

From FCC Chairman James Lawrence Fly:

Dear Ken Warner:

As the flywheel about whom all significant amateur radio activities appear to revolve, your contributions to radio over the past quarter of a century should be a source of real satisfaction to you.

As the motivating force which gave the amateurs their first organization back in 1917, you have, over the long haul of the past 25 years, continued to forward the cause of amateur radio in English-speaking countries throughout the world. . . .

From FCC Commissioner T. A. M. Craven:

My dear KB:

... I have been in contact with you on various occasions through the entire twenty-five years of your service with the League. As you may recall, these contacts were primarily ones in which you represented the League in important national and international radio conferences. On these occasions it was your duty to secure a place in the radio spectrum for the radio amateur. To do this you had to compete with commercial and private enterprise throughout the world, with Federal Government agencies in the United States as well as with foreign governments, all of whom were seeking allocations in the very same radio spectrum. That you were so successful in maintaining the justice and claim of the radio amateurs, is not only a tribute to your ability and character but also is a service which you have rendered to the Nation. . . .

Ordinarily this would be the place for a detailed recital of K. B. Warner's record of service during his twenty-five year career with ARRL. That, however, we're not going to attempt — if only because he would, we know, have our scalps for using *QST* space for the purpose when paper is so precious. As W3KP-W4ES expressed it: "It would take a long time to put down on paper all that you have done for amateur radio, and even longer to express appreciation for your efforts. Perhaps it is best to sum it up briefly and say: 'A tough job, well done!'"

Perhaps Connecticut's Senator John A. Danaher came close to summarizing that job when he wrote:

My dear Mr. Warner:

... The sheer romance of radio as a means of communication with its limitless possibilities which you foresaw, is matched by the allegory of a young man whose genius took him from the status of radio amateur in Cairo, Illinois, to that of internationally known expert representing the amateurs of the United States at Cairo, Egypt. Even the idea of international coöperation as you nurtured and expanded it demonstrates that thousands of like mind and kindred interests linked by international radio communications might be regarded as a symbol of similar achievement in other fields in time to come.

If it be true, as someone has said, that man's greatest joy can be found in achievement, your cup must indeed be overflowing. . . .

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special edition for war training purposes or the Standard Edition may be used. References contained in the "Course" are identical in both editions. As a text, this book greatly smooths the way for the student of the technicalities of radio. It contains interesting study assignments, experiments and examination questions for either class or individual instruction. It describes in detail 40 experiments with simple apparatus giving a complete practical knowledge of radio theory and design.

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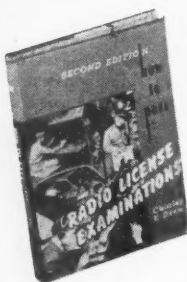
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QST-6-44

**Correspondence**

(Continued from page 68)

The nation knows something about the technical and operating abilities of radio amateurs. Certain manufacturers are paying high tributes to the radio amateur publicly in national advertisements. But the world will be different when the war is over and the government should realize that radio amateurs can serve the nation after the war in more than a technical or operating capacity. . . . The League should encourage amateurs to specialize in foreign DX, and to learn the languages, particularly Spanish. Every amateur having suitable equipment should reach out and seek the foreign amateur and talk to him, to his family and friends in order to bring about mutual understanding and closer friendly relations. In the new world to come that, in my opinion, will be the radio amateur's most important service to the nation.

— Charles I. Otero, W8UPH

**THE GOOD OLD DAYS**

Army Service Forces Unit Training Center,  
Camp Ellis, Ill.

Editor, *QST*:

. . . I just want to tell you how much I enjoy reading good old *QST*. It surely reminds me of the good old days on the air when the QRM was thick and heavy on forty. But now the world has a very bad case of QRM shall we say, which I'm sure we shall clear up in a hurry. . . .

— Pvt. H. L. Hale, jr.

**CONSTRUCTIVE COMMENTS**

Somewhere in North Africa

Editor, *QST*:

I have been a ham since 1935 and have been reading *QST* for quite a number of years. I have been overseas in this area for eighteen months, and in all this time I never read a better editorial than the one which appeared in the April issue of *QST*! It fits the present picture like a glove. I know, being a radio operator myself.

Lt. Larimer gave some very constructive criticism, and let's hope that most of the fellows who read it take it the same way I did. There is only one thing I would like to comment on. The responsibility rests as much with those in authority as it does with those who actually do the work. If the officers will instruct the men in the proper procedure instead of taking it for granted that they "know it all" because they went to a military training school, I am sure more than half of these practices would cease. I am not trying to formulate an excuse for the offenders. I am merely trying to find, in my own way, a method of making sure that all hams will do the best job they know how and keep up the good work they have done up to this point.

Although most of my radio work until the present time has been hamming and I have taken very little interest in the commercial end . . . I

(Continued on page 98)

*Accuracies to*  
 $1/6,000,000^{\text{th}}$   
*of an inch*

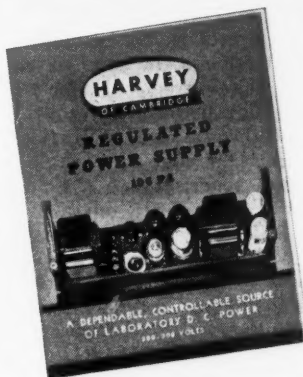
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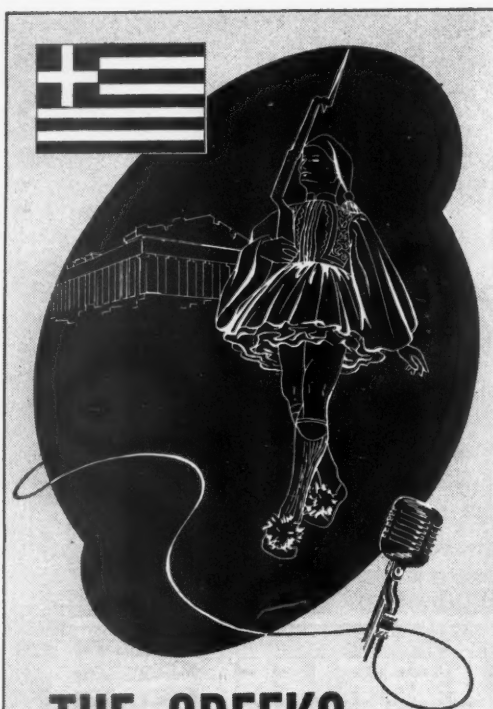
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★ 167 WASHINGTON ST. ★  
BOSTON, MASS., U.S.A.

(Continued from page 90)

do feel that *QST* has made a lot of us fellows over here "radio conscious." . . . My hat is off to you and keep up the good work; your constructive comments do help in more ways than I would be able to tell you.

*QST* has made a lot of friends for me over here whom I hope to keep after the war. There are Englishmen, Frenchmen, "Aussies," North Africans, and many others whom I hope ham radio will bring me closer to — if not in person, then at least by radio contact. . . .

— Louis Gerbert, RM2c, W8NOH

### FLEA POWER

114 Wallace Ave., Bellmore, L. I., N. Y.  
Editor, *QST*:

I was always quite interested in flea power, and before we amateurs were closed down I proceeded to experiment with it. The reason for my interest was the usual BCL interference.

I started with a 2-watt 6J5G crystal oscillator, with which I worked the 9th district with a fair report.

These results naturally aroused my further interest and I wanted to lower my power still more. I dropped the plate voltage on the crystal oscillator and it would not oscillate. I then built up a small e.c.o. with a 6SK7, using an untuned plate circuit. I began by putting 100 volts on the plate with 10-ma. plate current. I coupled an antenna to the plate through a 100- $\mu$ fd variable condenser. I got surprising results with this one watt of power. I then lowered the voltage as much as I possibly could still having the 6SK7 oscillate. At this point the plate voltage was 15 volts and the plate current was a mere 1½ ma. This meant the flea power input to the plate was about 1/50th of a watt. With this power I worked a local OM four miles from my QTH with a 589X report. I also worked a station 12 miles away with a 569X report.

All of these experiments were performed on the 160-meter c.w. band at 1785 kc. The antenna used was a 160-meter end-fed Hertz about 15 feet off the ground. For only 1/50th of a watt these results seemed to be quite amazing.

— A/C Robert H. Schill, W2NLD

### FROM A W8 IN ENGLAND

Somewhere in England

Editor, *QST*:

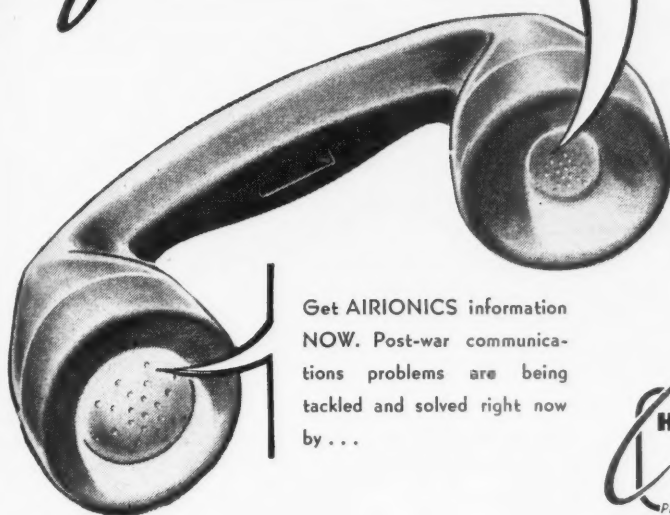
I have received and enjoyed the last couple of issues of *QST*. . . .

I have been invited to join the RSGB by John Clarricoats, G6CL. He is really a swell fellow and a very enthusiastic ham to say the least. I have the distinction of being the first DXCC member from outside the British Isles to visit RSGB headquarters. . . .

Ham radio is playing a most important part in the war in many ways. I only hope that

(Continued on page 94)

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Operating an Amateur Radio Station		Amateur Radio Map of the World . . . . .	\$1.25
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their first names*

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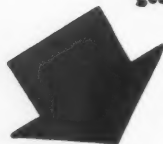
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(Continued from page 98)

those in authority . . . in the postwar period will appreciate the importance of amateur radio, past, present and future.

I have been an officer in the Signal Corps for two years and have had the privilege of working with many hams on fixed station equipment ranging in power up to 40-kw. output. The ham in most cases is a versatile man. I have not encountered a single case of trouble that has not been cleared in a minimum length of time when ham personnel were on duty. I feel sure that the hams are giving this same service all over the world wherever they are stationed. There are fifteen hams in my unit and they are all doing a good job. . . .

— Lt. Albert H. Hix, W8PQQ

## FROM AN OLD TIMER

Somewhere in Canada

Editor, QST:

. . . I suppose I come pretty close to being an old timer in radio these days, what with all the young squirts coming out of Scott Field and the rest of the schools, as I cut my teeth on a loose-coupler back in 1921 or thereabouts. Tried to get a coherer to work, with no great success (what a man Marconi must have been), then hooked up a chunk of galena and cat-whisker. Tried a piece of hard coal, but that didn't work any better than the coherer. . . . Decommissioned because of the war. No WERS, but no fear of bombing either.

It was in 1930 that I went up for my ham ticket; my financial status determined my rig for me, rather QRP. . . . I think the biggest thrill I had was starting a message for my old school teacher addressed to her sister in China — unless it was getting an answer, via W1MK and a retired colonel in Carmel, Calif. . . . I dropped out of radio a year or so later due to the usual circumstances — chiefly financial.

I got another ticket in 1935 and fooled around a bit with 5-meter 'phone, using a Wing transceiver, but never could get up much interest in phone; always wanted to pound brass and push traffic. . . .

About this time I'd had a hitch in the Naval Reserve, part of the time as radio striker, and I decided to see how the other half lived. I enlisted in Co. F, 182nd Infantry just in time to spend a week patrolling the banks of the Merrimac River after the Lowell flood of 1936. This didn't discourage me and I put in four years in Co. F. Then I thought I'd again see how the other half lived and signed over in I Troop of the 110th Cavalry of Boston. I liked the horses fine, but just about as I was getting along pretty well with them the outfit was redesignated the 180th Field Artillery and provided with 115-mm. howitzers. As I was wearing sergeants' stripes at the time it was up to me to learn something about the pieces. . . . We had been artillery for only about three months when we were ordered out for a year's training. We moved into Camp Edwards

(Continued on page 98)

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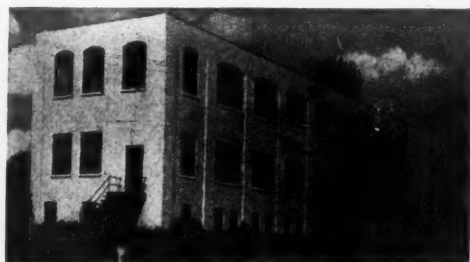
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in a fine cold Cape Cod January, and spent eight months there before going to North Carolina for the big maneuvers in the Fall of '41. We survived them due largely, I think, to the kindness and hospitality of the people of North Carolina who took us into their hearts and homes. We returned from the South arriving at Camp Edwards late in the afternoon of December 6th. The next couple of weeks were a bit hectic. . . . We knew we would be on the way before long, and this was confirmed when furloughs came through.

About this time the Air Corps was badly in need of radio operators, so I went up to Westover Field and got permission to transfer to one of the outfits there. Transferred in grade, too, which was quite a trick. Since that time I've been c.w. operator, chief operator, and station chief. . . .

The Army radio schools are really wonderful. I went through a six weeks' course on AACs equipment at Scott Field in the summer of '42, and when I got through, I really knew the equipment. . . . I think the soundness of the Army methods of teaching is proved best of all by the way the boys coming out of the schools pick up speed when they get on the air. They turn up fresh out of school with a speed of — maybe — 16 w.p.m., and a short while later they are working traffic at 30. And that is doing pretty well, regardless of what the speed merchants say. . . .

— T/Sgt. J. A. Morrissey, ex-W1JEV-WICTT

## Splatter

(Continued from page 8)

a mobile rig installed in his car, using a 955 detector, 6J5-6V6 a.f. and modulator, and an HY75 oscillator.

S. E. Spittle, W4HSG, built his first receiver (galena detector and house telephone receiver, with no tuning) in 1920 or early 1921. At first results were conspicuously absent, but after finally accumulating wire enough to make a fairly long antenna he succeeded in receiving NPE three miles away. Presumably it was this experience with the benefits of addition that led to the subsequent interest in mathematics displayed on p. 20. Late in 1923 he went on the air with one UV202 and the call 7AIX. Since then he has held the following additional calls: 7AAY, W2CAE, W3EQP, W4HSG, W9QOA. Graduating from Oregon State College in 1928, after about a year's experience in the power and light game he went to work at the Signal Corps Laboratories, Ft. Monmouth. He has been employed in Signal Corps activities ever since — in Washington, D. C.; Omaha, Neb.; Atlanta, Ga.; Trinidad, West Indies; Rome, N. Y.; Boston, Mass., and at present in Philadelphia. While in Omaha he was a member of the Nebraska AARS net and maintained W9BNT, the Army's 7th Corps Area NCS. Benjamin Toy, our rhetorical recruit (p. 48), writes: "I am sixteen years old and a senior at the English High School in Boston, from which I will be graduated this coming June. I am

(Continued on page 98)

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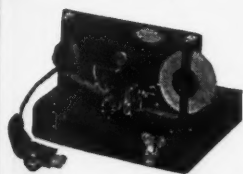
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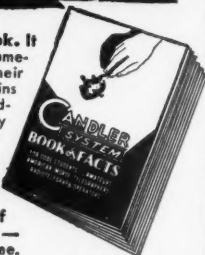
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(Continued from page 96)

literary editor of the *English High School Record* and, in addition to handling make-up work, write feature articles and a regular radio column. . . . I have been interested in science since about 1936 and in amateur radio since 1938, when I accidentally acquired an ARRL *Handbook*. I received my Class B license in 1942 and my Class A license in 1943. I intend to enter college after graduation from high school and study electrical engineering. The equipment described in the article has been built since Pearl Harbor. It was all constructed with the stated obstacles in view. For a while the receiver power supply was used with the r.f. section. The receiver, transmitter supply, and modulator were added in the named order. Since I have had no operating experience and this is the first practical project I have undertaken, I believe that I have approached the beginner's problem from his own angle."

Again with us are, on p. 31, A. D. Mayo, W4CBD (Splatter, Nov., 1943, p. 10) and, on p. 38, Edward M. Noll, ex-W3FWJ (Splatter, Oct., 1943, p. 8).

## FEEDBACK

PERHAPS it was a general uprising instigated by the Loyal Order of Lice as a whole. Or it may have been only a sympathetic local protest against Dr. J. Burp's exposé of their cousins, the Tube Lice. Anyway, the Type Lice at QST Factory raised havoc again last month.

So, while our apologies subside, get out that May issue and make the following corrections:

P. 14 — In the parts list for W8FER's walkie-talkie circuit diagram, the modulation choke,  $Ch_1$  in the diagram, was incorrectly identified as  $L_3$ .  $RFC_1$  and  $RFC_2$  should have been listed as Ohmite Z-0 v.h.f. chokes.

P. 23 — In the example given by ex-W3FQJ referring to Fig. 7, the quotient of 250/51,000 should be 4.9 ma., which makes the grid voltage in respect to ground 4.9 volts instead of 4.1.

P. 33 — In the circuit diagram for W1JLK's camper's portable, Fig. 1, the extension of the HY75 plate lead which appears to connect it to the line between  $S_6$  and  $RFC_4$  shouldn't be there. The HY75 plate is connected *only* to the hot end of the  $C_{11}L_3$  tank.

P. 52 — In the circuit diagram for the G1 intercommunicator, Fig. 5, the ground connection for the 6SF7 cathode circuit somehow was omitted. The bottom of  $C_3R_5$  should be grounded in the usual manner, of course. In the same diagram the screen grid of the 6K6, now floating all alone in the electron stream, should be tied onto the lower end of the primary of  $T_6$ .

Going back now to the April issue, a few experimentally inclined type lice apparently warming up for their May sabotage succeeded in transposing some specifications in the parts list for W4CBD's ham-band superhet, as shown in Fig. 1 on pages 14 and 15.  $C_{60}$  should be a 0.1- $\mu$ d. 600-volt paper condenser;  $C_{64}$  should be an 8- $\mu$ d. 450-volt electrolytic, and  $C_{66}$  should be a 40- $\mu$ d. 25-volt electrolytic.